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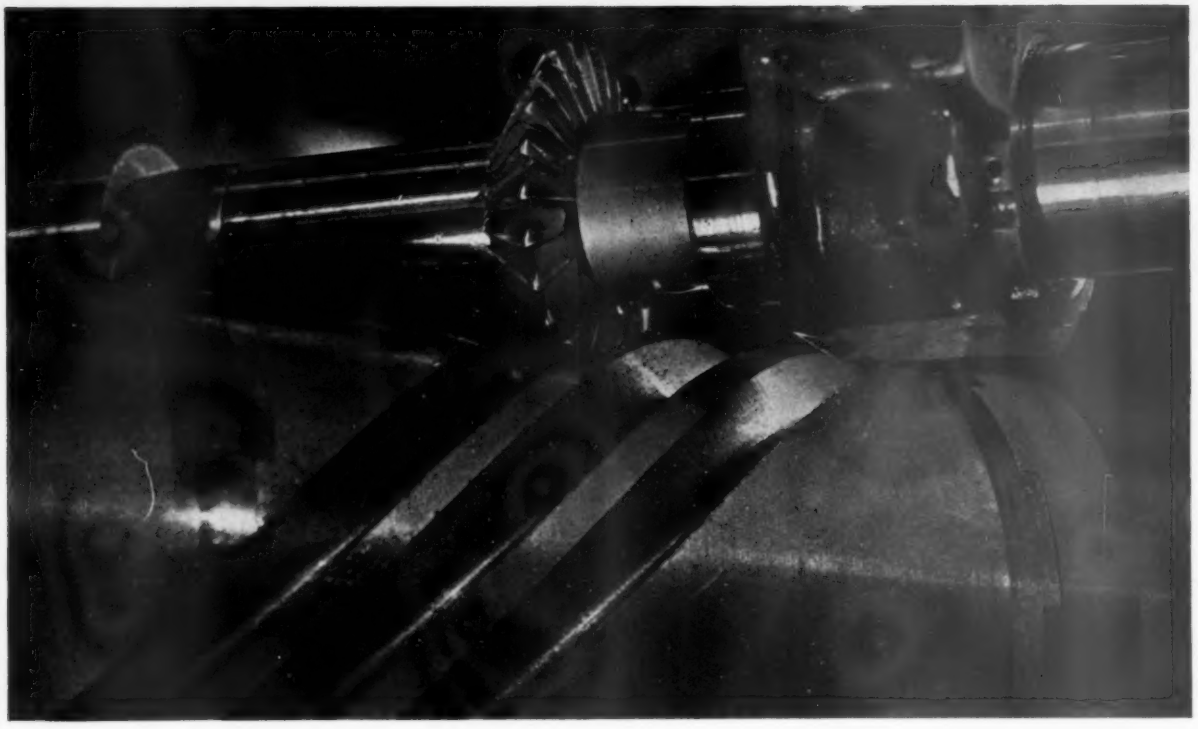

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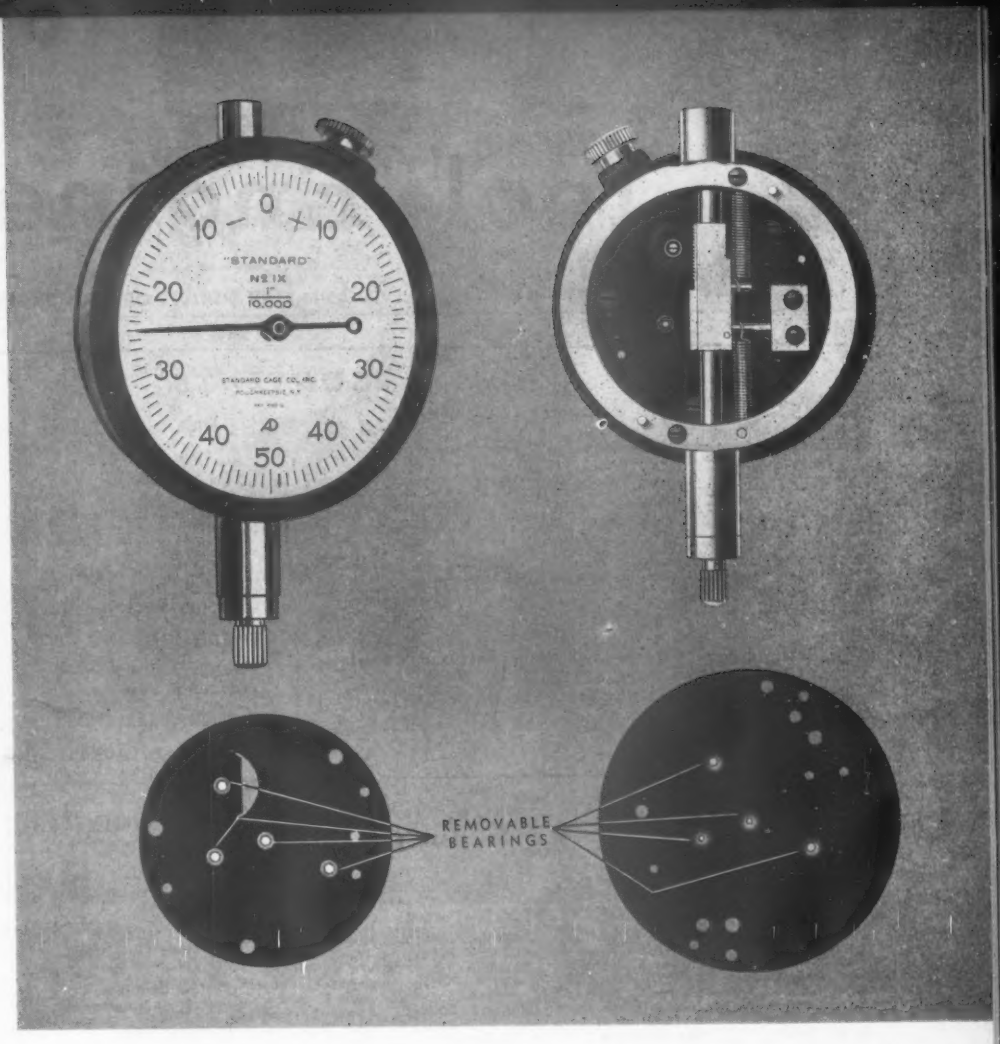

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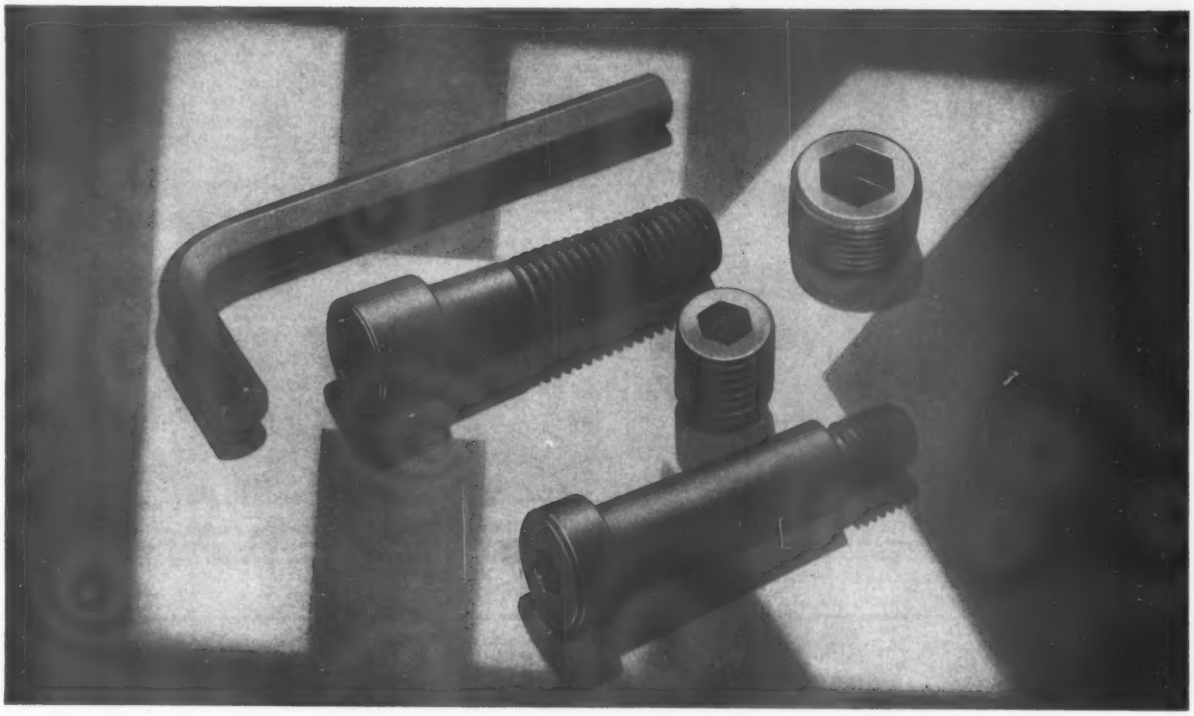

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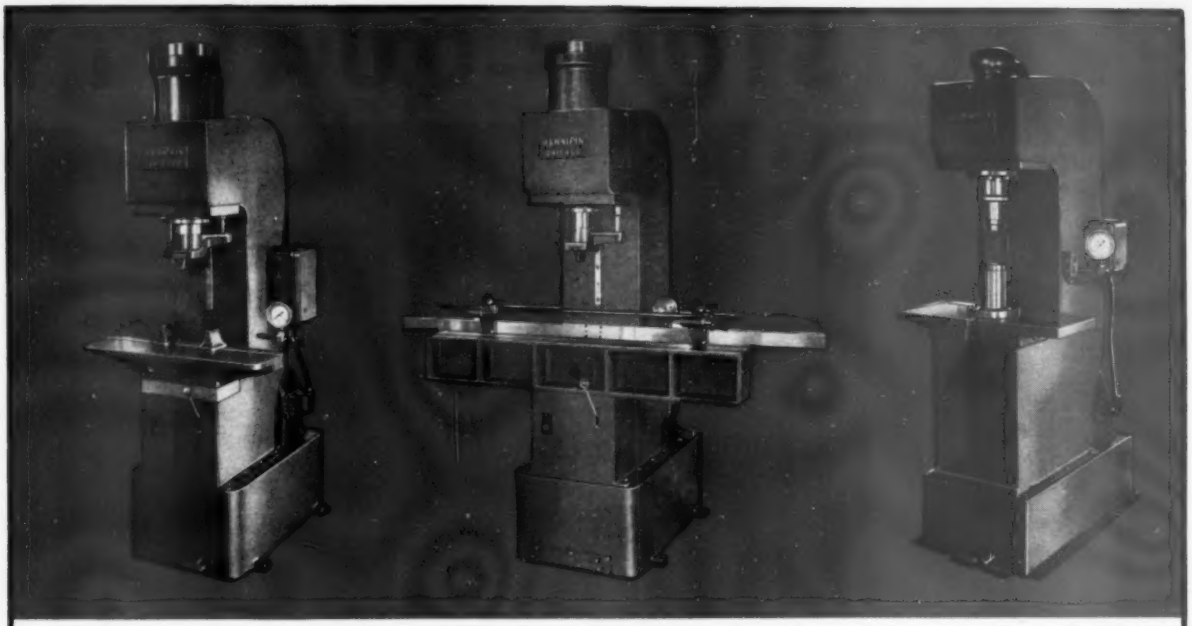

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» » GIVE INDUSTRY THE BREAKS « «

An Editorial
By A. E. RYLANDER

WHEN, in the spring, an automobile manufacturer releases preliminary drawings for the coming model, it is expected that the job be refined for manufacture, tools designed and made, and that it be in production before the summer is done. Say, at the outside, six months from preliminary drawings to the deadline set for mass manufacture, even though the new model may be such a radical departure from its predecessor that it entails complete obsolescence of existing tools and methods.

Taking a frame as an example—although any unit, as an engine or body, would be equally illustrative—let us split the job up into elements. The frame plant engineers receive preliminary prints some time in March. From these, estimators deduce costs, while methods engineers consider tooling and handling and suggest such changes as may be necessary for best parts manufacture and assembly. These suggestions are submitted to the customer's engineers, who must pass on the changes. Then, when these preliminaries are over, the job goes to the product engineers who have parts drawings and assemblies executed, down to the last detail. An Herculean task in itself, as the initiated know.

As fast as working drawings are released, Tool Engineers go to work, product and tool design overlapping and, often, ending up together. An intensive engineering program has been initiated that, needless to say, frays nerves and tempers to a feather edge. For time is short and engineering is but a means to an end; each tool, die and special machine must go through the shops, and even there the work is but an intermediate stage in the cycle of preparation. The end in view is mass production of the job outlined in the preliminary drawings.

Coincidental with design and tooling, there is commercial equipment to be considered and purchased, preparation of machine beds and press foundations, the routing of parts and layout of conveyor systems, all of which must be decided upon while current models are still in process of manufacture. Then, change-over, to be managed somehow in the brief time allowed for shutdown, the whole effected with a nicety and precision that would be the envy of a regimentalist. For here, in industry, is the American System at work, here differences of opinion are compromised with the better ideas prevailing; here is democratic coordination of various groups, each concerned with results. Here has been talk and trying conferences, but talk with a purpose; no rhetorical debate, no speeches for effect, but terse sentences illustrated with the indispensable pencil. And, at last—the deadline! "Let her roll!—we're ready!"

Now, this editorial is not written with a view toward aggrandizing the industrialists, the Tool Engineers, technical experts and skilled craftsmen who, collectively, comprise the automotive industry. Rather, for purpose of illustration, we have chosen a field with which the American public is familiar. The majority has long since taken to the road, as owners, drivers or riders. The point is that, when the first car rolls off the line —on time!—its buyer can look for performance and reliability. He would not hesitate to start, immediately, on a vacation tour that may include desert, mountain and rutted detours as well as the superhighway where the throttle goes temptingly floorward. Not one buyer, but millions, expects this performance; not one make of car, but each car of all makes, leaves the assembly line with the maker's reputation behind it.

No, this writing is not for the initiated to whom these things are taken for granted and of whom accomplishment is expected as a matter of course. Rather, it is written for the express attention of those who, by the grace of the people, hold elective or appointive political offices. It is a case for the men who know as against those who have much to learn about the methods of industrialists and engineers and their genius for getting things done. And, it is quite essential that the lessons here outlined be considered on their merits; our national security may depend on such consideration.

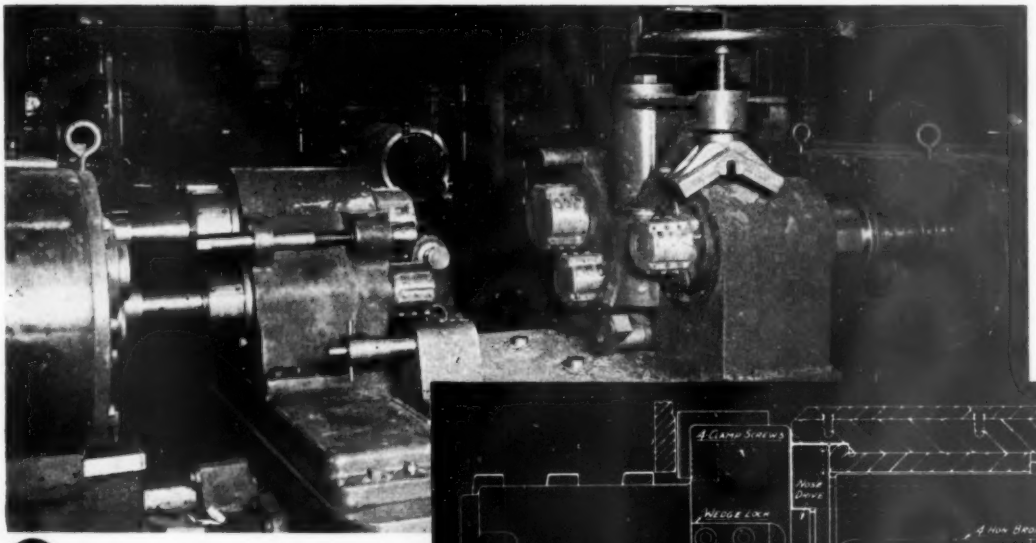
At this time, we are faced with one of the gravest situations in American history. While, as Tool Engineers, we are committed to construction (as previously set forth in these pages) there has been forced into our consciousness a dramatic picture of the efficiency of the machine when put to destruction. For, in the drama of war now being enacted, we see the exponents of tradition fall back before the single-purposeness of the modernists of war; we see, with bitter realization, the difference between technical efficiency and political muddling. We see the terrible price that is being paid for unpreparedness, and we may as well concede that, to all practical purposes, legions with rifles and antiquated field pieces are as helpless before the modern *panzer* divisions as medieval archers were before the charges of knights in armor.

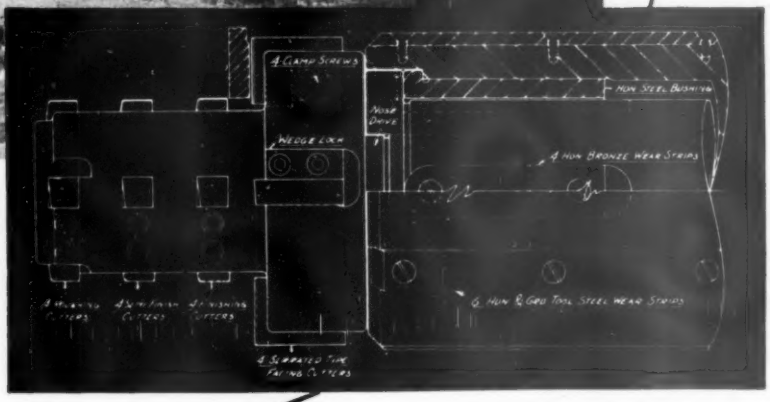
Now, our President has ripped the curtain from our neutrality, has all but committed us to war. Let us hope, however, that he will defer "The Day" until our soldiers and sailors are adequately armed, that he will at least give industry as much time to tool for war as is ordinarily allotted for the comparatively minor job of putting a new car model into mass production. We would have our war machine roll off the assembly line ready to perform, and, only one body of men in this land is qualified to produce that machine—the composite body that makes up American industry.

We can say, with authority, that there is no device known to military science so precise that industry cannot meet its specifications, that there can be no demand for quality or quantity—or both—that industry cannot exceed. When an American manufacturer says that he can produce a thousand planes a day, he means that he can deliver that quota with the same inherent reliability and performance that has made his peacetime product a synonym for quality. When others say that they can produce tanks, gun carriages—any item within the gamut of war needs—in quantities named, their statements can be accepted as truth, not wishful thinking. All that is asked is reasonable time to prepare, and that industry be permitted to work out its program along lines in which it has proven its proficiency.

We do not concede cause for war at this time, (although we construe the President's recent speech as provocative of war) but, if we are to go to war, and if we are to prevail over a highly mechanized foe, we must have the advantage of superior armament. If we are to retain our vaunted guardianship of the western hemisphere—the Americas!—we must impress that superiority upon our Latin neighbors lest they be tempted to side against us. We are fighting, here, for a principle, that the spirit of personal and collective initiative and enterprise which has evolved into the American System, be retained. Only a superior machine can guarantee its retention, and American industry alone can deliver the machine. Therefore, it is essential to our social, economic and political salvation that industry be permitted to function without political interference. Gentlemen, we have stated the case for industry. Here are the facts; ponder them, but not too long. And decide—wisely.

STUDY THIS EFFICIENT SET-UP OF DAVIS BORING TOOLS!




4 CLAMP SCREWS
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DAVIS BORING TOOLS

Industry's Requirements in Cutting Tools and Materials « «

by E. S. CHAPMAN
General Works Manager, Chrysler Corp., Plymouth Division
Detroit, Michigan

Figures rather than opinions—actual performance records of cutting tools and materials—these substantiate the author's remarks here. Three shifts a day with large production provides an intensified usage of tools found but rarely in most production plants.

THIS is a rather dry subject, because it has to do with statistics, figures, but I thought that that might be more valuable than opinions. So we have taken advantage of the records we have kept over a number of years. I will give you a description of the laboratory in which this data was accumulated. We have been assigned the job of machining 125 sets of parts an hour in the Plymouth Plant, which is our setup at the present time. That means a three-shift operation. We work all through every working hour of every working day, and under our arrangement that means five days a week. So, where it is one piece per motor it is 125 an hour. Where it is, I will say, pistons, connecting rods, six pieces per motor, six times that. We have an opportunity, therefore, to get an experience with a very intensified usage of tools. Tools are very important to us.

So we decided that it was necessary to keep track of it, and we have kept meticulous records of the results of the tools used. I have taken, I have forgotten how many, but at least a dozen pieces on which we have records, and without boring you unduly with statistics I am going to tell you the value of these records which, I think, is one of the most important things that we can do—keeping records of that kind.

Of course, one of the major parts of a motor is the cylinder block. In our case the block is an iron casting. It is around 200 Brinell. We take off possibly a little over seven pounds of iron in the roughing operation of the top and bottom sides. I would like to have the operation shown here.

Slide No. 1

Is a Newton mill. You will notice that every fixture alternates. One of them is the top and one is the bottom. We mill off seven pounds of iron there in a very short space of time. And we have been through quite an experience on that job. We started with a tool cost of over $2.00 per 100 blocks. We now have it down to 15 cents per 100 blocks. The reason we have it down to that comparatively low figure is because of keeping good records. I would like to have a closeup of that operation.

Slide No. 2

One of the things that was done was to arrange a salvaging operation using longer tools, and when that was started it cut our tool cost in half. You will see there in the milling cutter long enough tools so that they can be reoperated. I want to say to you that over a period of five years the tool cost has been brought down from $2.00 per 100 blocks to 15 cents per 100 blocks. I think that proves pretty well the value of keeping records on tools. In the old days we used to have quite a problem in transmission, slipping out of gear, slipping out of high, we used to call it. One of the causes of that was misalignment. We decided to face what we call the clutch housing after it was assembled in the motor block, to be sure that it was definitely square with the main bearings. In that job which was, you might say, an excess operation, we used to use—it is a little wrong to use trade names here, but we used to use, I will say, a tungsten carbide on which our tool cost was around 32 cents per 100 motors, which is a fairly high cost, in our language.

We ended up with another tool, with another kind of material for tools, which dropped that tool cost to just over 12 cents a 100 motors, which you will agree, is a very worthwhile saving.

All through this little talk of mine, which I admit is a very dry subject except that it means real dollars and cents to the owners of the business, I may have to quote a lot of figures. But they are the result of a careful campaign to keep track of what these tool records really do for us.

Slide No. 3

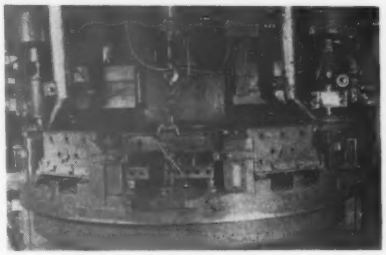
So in this little operation which I mentioned, you see it here, after the clutch housing is assembled to the block we put it across some milling machines and we square it up, and in that case, by keeping records and by paying attention to the job, we have reduced our tool cost to just about one-third of what it used to be.

Slide No. 4

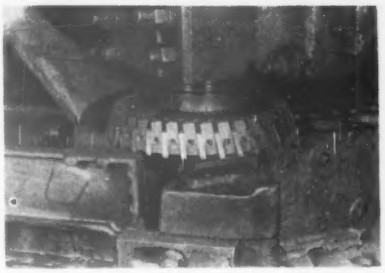
I will show you a number of pictures of our flywheel operation, but this particular one has to do with the turning, and of course there is a flywheel on every engine. We need 125 an hour, and I want to say that by reason of keeping records of our cost our tool cost in that particular job has dropped from over $3.00 a 100 to about 35 cents per 100. That is a tenth of what it used to be.

Slide No. 5

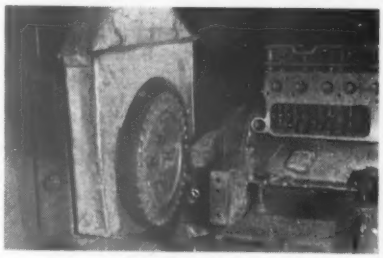
This is a simple operation. But it all costs money, and when you are running 125 pieces an hour, three shifts a day, it means a lot. Another thing that I brought to you for an example is the



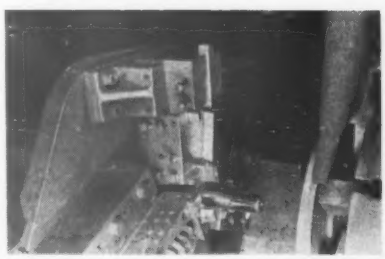
SLIDE 1



SLIDE 2



SLIDE 3



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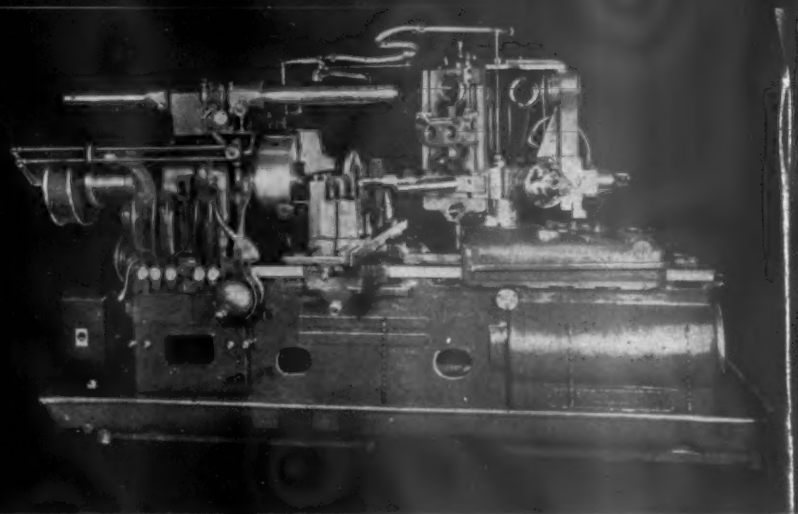

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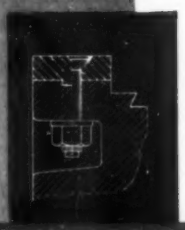

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POTTER & JOHNSTON MACHINE CO., PAWTUCKET, R.I., U.S.A.

Automatic Machine Tools

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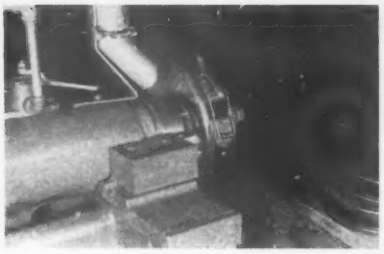

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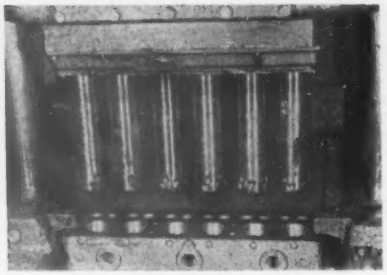


SLIDE 8

hub and brake drum. It isn't a very light picture—but we mount the brake drum on its bearings so that we can finish turning on the inside surface and be concentric. In that case I want to say that by keeping records and by paying attention to the operation we have dropped the cost of the tools for turning that from 11 cents per 100 pieces; there are four, of course, on each car; to under 4 cents, (.037). That was done with a carbide tool which turned out to be the cheapest tool material we could use on that particular job.

Slide No. 6

Some time ago we realized that we couldn't get the most efficient job out of our cam shaft department because our equipment for turning the cam, which of course includes the bearing diameters and the fuel pump eccentric, etc., was of an old type which wouldn't stand the speed that could be realized with modern tools. We finally got the money to put in modern equipment on that job, which you see here in the picture, and our tool cost, along with other costs, dropped from 16 cents to 9 cents a hundred pieces, which I think is a very good example of the value of new modern equipment.

Slide No. 7

The next example has to do again with the flywheel, a boring operation. Boring is pretty exacting, that is a very demanding operation, because, of course, with the wheel weighing, we will say, 40 pounds, any eccentricity causes unbalance and roughness in the motor, so we had to pay a good deal of attention to that. And in that case, due to keeping good records—this may sound a little bit extreme, I was surprised myself, but the fact is that when we first started in with the boring of the holes in the flywheel, our cost per 100 pieces was $2.60. We now have it down, due to keeping records, to 9 cents per 100, which is a pretty good illustration of the value of keeping records and testing materials on these operations.

You will see the boring tools, of course, in the bar there. We have a number of setups on that. When you are running the number of pieces that we do, a number of setups are required. You have a variety of operators if you have three shifts and you have a variation in the material and so forth. We give weight to all that, and we don't make our decision on what tool we put on the job until we have run a very large quantity of pieces, in this case something like 25,000 or 30,000 pieces. So we have a test ground there that is perhaps a little more conclusive than you would have in the ordinary shop that runs eight hours a day, five days a week, because we run 22½ hours a day, five days a week. I would say that in the last several years the keeping of records on tools has meant to the Plymouth Division probably three to four hundred thousand dollars a year, I estimated it the other day when I knew I was coming down here, and that is a worthwhile saving in any plant.

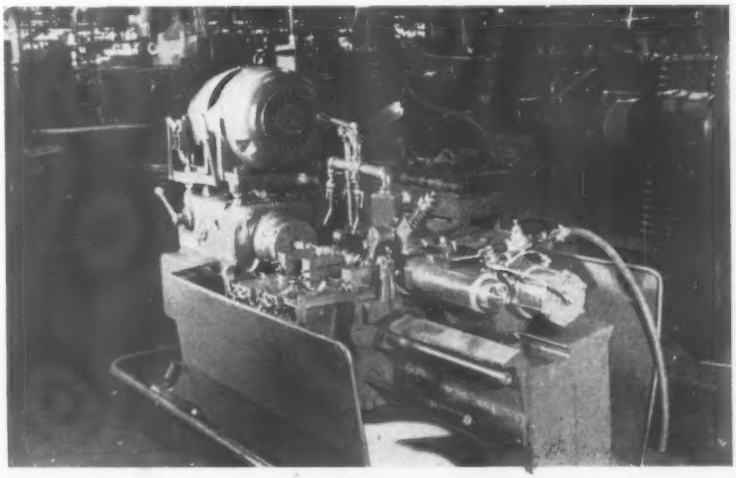
Slide No. 8

The next operation I want to talk to you about is the cylinder block. That is the rough boring. The cylinder block has probably the most severe duty of any item in an automobile so they use an analysis of iron that is pretty hard, and we have had a lot of fun trying to get this block bored at the minimum cost. I want to say that due to the mechanical division, paying attention to what it costs to bore a block from a tool standpoint, we have dropped the cost of boring a block from almost $6.00 a hundred, to $1.293. And that is real American money when you are talking about the quantities that we run. I give credit to our mechanical division for keeping track of this thing and for finding out what type of material is the best cutting tool.

Slide No. 9

Here is another job on the cylinder block. You see it here. We found years ago that the temperatures in our exhaust valve outlets were pretty severe and to take care of that our engineers provided an alloy for valve seats, what I call "red hard". It is hard at a temperature that causes it to be red hot, cherry red. But in doing so we had to counterbore the valve seats which provided an additional operation, which was well worth while, and by keeping track of what it cost us to make this counterbore we brought the cost down. It so happens that when we started the job it cost us about 2 cents a hundred for tool cost, which is a very simple operation—you can see it here from the slide—and we have dropped that down by getting the right tool material on the job to 6 mills per hundred, which is not enough to worry about because it does so much for the motor.

I go back to the flywheel again, (Slide No. 4), a shaving job. A flywheel has become a pretty flat piece, but it must have a good surface, and the reason it must have a good surface is that in operating



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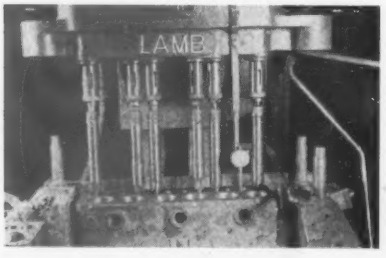

SLIDE 9

TRICKY JOBS CALL FOR TRICKY IDEAS

How would you tap a deep through hole in tough forged steel parts like these — speed being a major factor?

This is the way a G. T. D. Greenfield Engineer did it. A special high speed steel tapper tap to save "backing out" time—a pilot point for accuracy, a short thread to reduce resistance, two flutes for a strong cross section able to stand the high speed and torque.

Result — no more worries on this job — where incidentally, accuracy is checked by the G. T. D. Greenfield thread gage shown in the picture. See why it is so often good business to call in a G. T. D. Greenfield Engineer?

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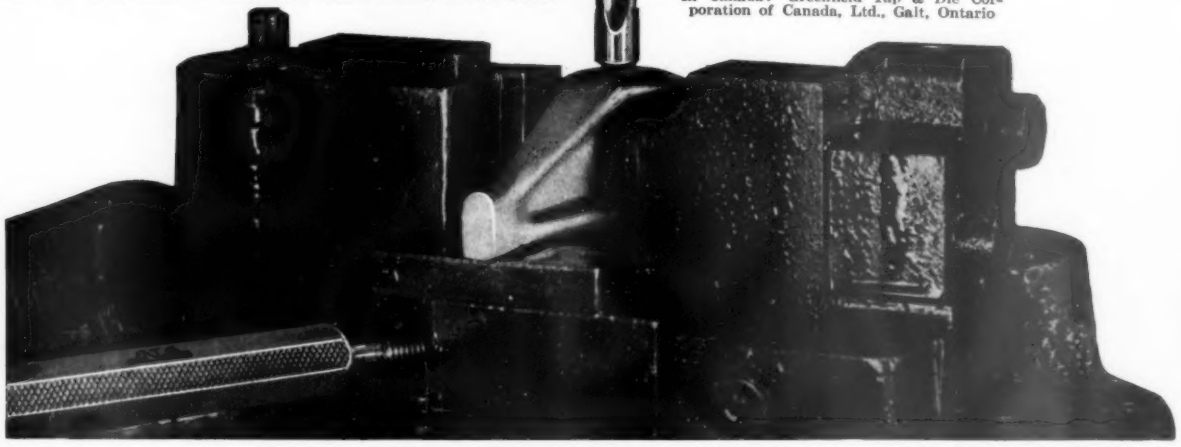


the clutch as the ordinary driver does, the pressure plate, so called, is a small piece of iron, comparatively, so it doesn't dissipate the heat, and without a good surface you generate too much heat and you burn out the clutch lining. In this case we found that we could shave the flat face of the flywheel, which is the forward pressure surface, on our flywheel turning equipment, and you might be surprised to learn that by paying attention to the kind of tools to use there we dropped the cost per 100 from .15 to .12.

I am talking now in terms of automobiles because that is my business. If Jimmy Weaver is here, that is swell. I wouldn't say anything in connection with the generators and armatures and stuff that he is supposed to know about. But because of our keeping records we are able to sell a 3,000 pound car or more now for about the same price that we sold a 2600 pound car a number of years ago. And this is one of the factors that makes that possible. You just have to keep making progress, you can't stand still. I give this to the people that supply tool material to us. They have been very constructive, very helpful. We make tests, because we insist on knowing what is up to date, and so I am giving you here our result of the records that we have kept on some of these tests.

Slide No. 10

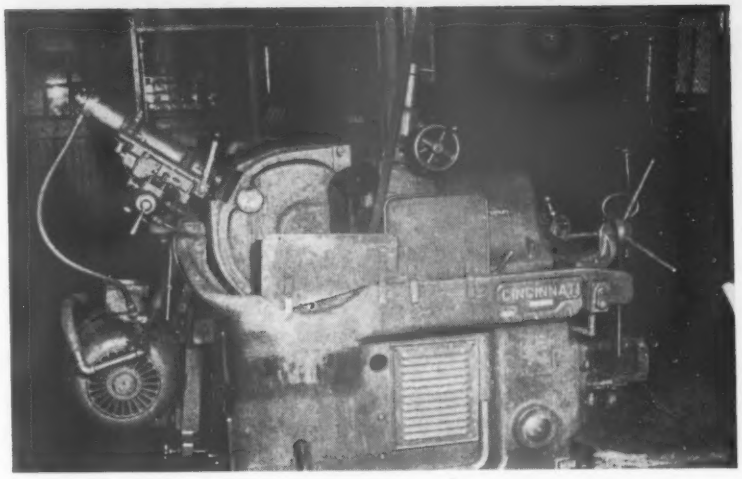
My next one has to do with what we call our valve guide, and our problem here was to find the rest or support for it in the centerless grinders. Of course, there are 12 per engine, a lot of pieces. Our problem was to find something that would stand up and give us satisfactory life for the work rest. I want to say that by paying attention to this our cost dropped from $5.65 per 100 to 22 cents per hundred, and we wouldn't have known it, would not have been conscious of it if we hadn't kept records on the operation.

They put quite a selling campaign on these centerless jobs, with a lot of stuff, but we found that chilled iron, from our experience, in that particular case was the most economical thing that we could use.

Another job which has been included which isn't strictly on the subject of cutting tools, perhaps, but is interesting, has to do with the grinding of aluminum pistons, a similar job to the one we just discussed.

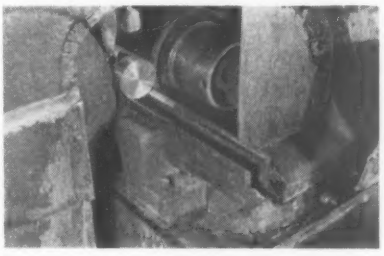
Slide No. 11

This is one of those jobs where we have, of course, six pistons per motor. We have to provide 125 sets of parts per hour which means 750 pistons per hour. This is rather interesting to me: Our design is such that our engineering specification calls for an eccentricity in the piston of about .013. We grind it on a centerless grinder. It is an interesting job. But one of the problems we had was supporting the piston on the rest, supporting it accurately so that we got our diameters



SLIDE 10

what they have to be, which in the case of a piston in our jobs is very close. We tried a lot of things. We tried Tungsten carbides, and we tried all these things that are supposed to have a high wear factor, but we ended up in that case with chilled cast iron, and it cut our cost from about $1.35 per 100, (and 100 is nothing.

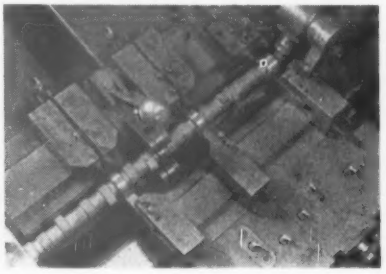


SLIDE 11

that is a few minutes run), to 18 cents. The thing I want to emphasize here and the thing that may interest you men is the importance of keeping records of your cost of tools. It has been a very interesting subject to me.

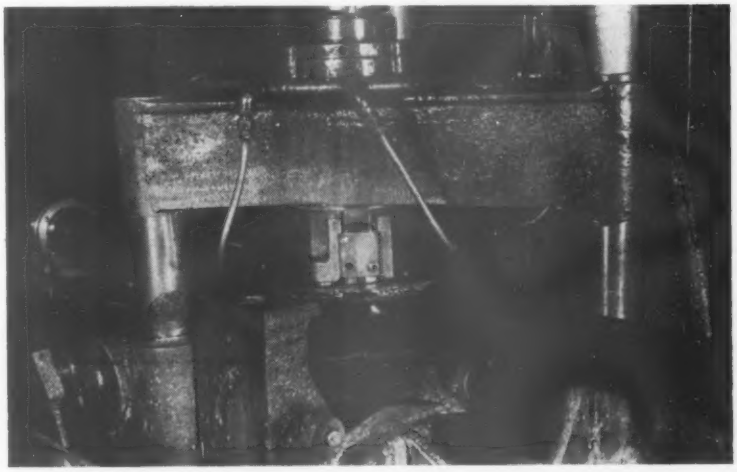
Slide No. 12

We have the cam shaft. In our case we use a cast iron cam, what they call a meonite. It is an alloy casting, and it has been a great thing. It has wonderful bearing qualities. We used to use a forged steel cam shaft, of course, and when we changed, it became a problem as to how



SLIDE 12

to take full advantage of this new material. But our equipment was such that we couldn't take advantage of the new tool steels so we put on a campaign here a while ago. We had to get some machines with anti-friction bearings on the



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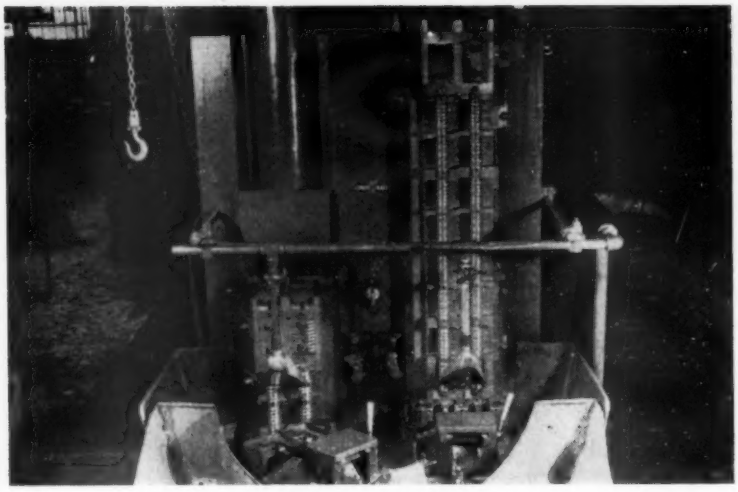


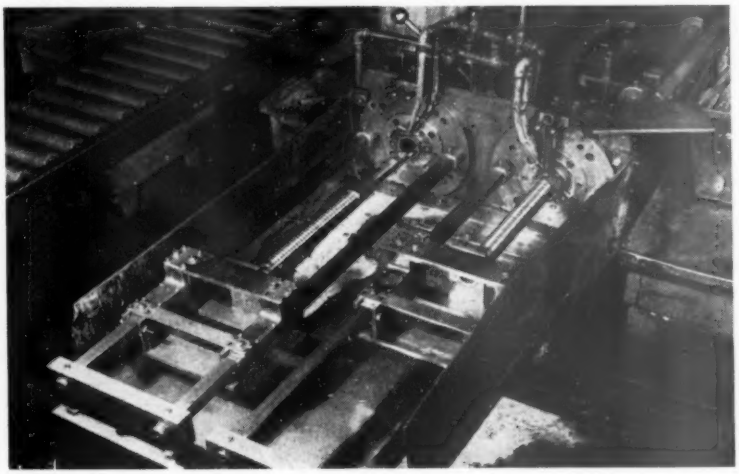
SLIDE 14

spindles to get the speed. Naturally, there is a small diameter and you have to whirl it right up there to get that stock off at a minimum cost. And if it is of any interest to you, I want to say that our tool cost per 100 cam shafts has dropped from .16 to .09. It is due to being able to take advantage of this new type of cutting material. I have a lot of figures here but I know it is a dry subject and I am not going to bore you with it, I am just giving you the net result.

Slide No. 13

We have another case in the rear axle housing. That is hot rolled steel. We have to face off the "banjo" housing, and it used to cost us almost $14 per 100 pieces, that is a tough operation, but we paid a lot of attention to it. The boys went to work on that operation. They got it down from nearly $14 a hundred, tool cost, to $2.06, which is a very worthwhile saving.

It is a funny thing about this axle housing; To look at it you would think it is a very easy operation, but there is a lot of welding on it, there are a lot of assembly operations, and to machine it and get an oiltight job you have to have a good setup, and to cut that thing down to one-sixth of the former tool cost is a very worthwhile saving. You can imagine what this means at 125 pieces an hour, 22½ hours a day.



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Slide No. 14

Now we go into broaching. Naturally, in a machine shop like ours we have a lot of different operations so I have tried to divide this discussion up into turning, milling, boring and broaching. This is broaching the connecting rod. It is a drop forging. Of course, here is another thing: It isn't only the material in this case. You can turn the broach around and take another grind on it. So while we talk about the tool cost per grinding, in this case we turn it around and take advantage of the other side, which doubles our broach life and cuts our cost in half and by so doing we cut our tool cost from around 4 cents to about .028 per 100 pieces. Of course with a rod there are 6 per engine, we build around 3000 engines a day, so it is a worth while saving.

Slide No. 15

This has to do with the pin diameter on the connecting rod, also, in which case by changing material for the tool we dropped our cost from around 60 cents per 100 to around 24 cents per 100.

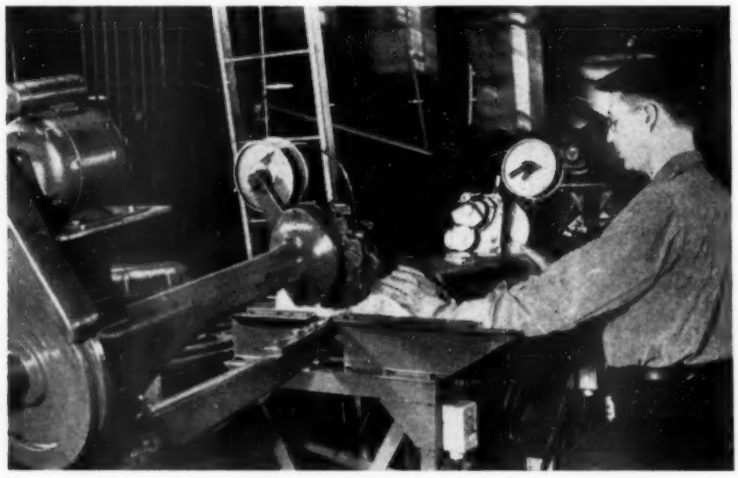
Slide No. 16

This is a different operation, doesn't have to do with cutting at all, but has to do with stitching. We have a gas tank that is made of two pieces, two stampings, and before we put it through the continuous welders we stitch the two halves together. It was quite a problem. The stitchers were lost a lot of time. So by checking up we were able to cut the cost of tools—this little anvil that you see down here between the two halves—from $3.65 to $1.25 per 100 pieces. It was very important, not from the standpoint of cost of tool, but from the standpoint of the time that the setup was down.

Slide No. 17

The next subject is the fuel tank again.

(Continued on page 66)



SLIDE 17

High Speed Steel Cutting Tools and Materials

By L. C. GORHAM
President Gorham Tool Company
Detroit, Michigan

WE will consider here the High Speed Steel section of this symposium. We will not have time to discuss the relative merits of the use of the various High Speed Steel analyses on specific applications, but must limit ourselves to a review of the materials available with broad suggestions as to the applications to which experience has found them best suited. We cannot expect to intelligently choose between the use of High Speed Steel tooling and tooling with other available cutting materials without a thorough knowledge of the mechanical and metallurgical problems involved, and a study of the comparative economies of the use of the various tool materials now offered. Likewise, before recommending the application of any certain type of High Speed Steel on a job on which the use of a High Speed Steel is indicated, we must consider, not only the problem of actually performing the operation, but also investigate the factors that determine the unit cost of furnishing and maintaining the tooling and specify the analysis that will not only do the work but will be the most economical.

High Speed Steel—Still a Major Tool Material

High Speed Steel remains a major tool material in spite of the vigorous competition of the Cemented Carbides and of the Stellite types. It is this competition that was responsible in a great measure for the progress that has been made in the past decade in developing new analyses of High Speed Steels, and in gaining a better understanding of how to best handle and apply the older analyses. This development work is a fine endeavor that will prove of great value to all who use cutting tools. It is unfortunate that the introduction of so many new analyses in rapid succession has led to much confusion among all those concerned with their use. One of the purposes of this discussion is to help in clearing up this confusion. That will best be obtained by reviewing the most prominent analyses of High Speed Steel now offered with a few suggestions as to their treatment and application.

High Speed Steels are divided into two basic groups; those in which Tungsten is the major alloying element are in the Tungsten group, while the Molybdenum group includes those analyses in which Molybdenum is the major alloying element. The alloying effect of Molybdenum is about twice that of Tungsten in equal percentages so that, in determining which is the major alloying element, an analysis would have to carry more than twice as much Tungsten as Molybdenum to be classed in the Tungsten group. This accounts for the classification of the newer analyses containing equal amounts of Tungsten and Molybdenum as Molybdenum High Speed Steels. All of the analyses offered to date are easily assigned to either group.

The analyses of the Tungsten group have been widely accepted and used for many years. The actual analysis of the 18-4-1 type has not been radically altered since its introduction, nearly forty years ago. The changes in analyses of the Tungsten High Speed Steels have been along the line of additions of elements designed to impart better physical properties to the completed tools. As production requirements speeded up and production alloys were introduced that were not ecomonically machined with 18-4-1 tools, the tool steel makers responded with variations of the old 18-4-1 analysis that have had wide acceptance and showed themselves to be commercially stable. Because the 18-4-1 steels are the most widely used and understood, we need not spend much time on them, but we must not minimize their importance. The 18-4-1 analysis is the lowest in price of the Tungsten Steels, and so is the most economical of this group for use in tooling that does not require better performance than is possible with an 18-4-1. It is probably the easiest of all High Speed Steels to properly heat treat and rework when necessary. Its ability to withstand comparatively crude methods of heat treating without decarburization or kindred difficulties is a major reason for its retention as the most widely used type of High Speed Steel.

High Speed Steel still remains a major tool material in spite of vigorous competition.

Introduction of many new analyses has led to confusion. This discussion should help to clear up much of this confusion.

Vanadium is added to High Speed Steels to increase the resistance to abrasion. This property is most important in operations where a keen edge must be maintained under adverse conditions. We have found that the 18-4-2 analysis warrants its increased cost over the 18-4-1 on many applications, but it seems to be particularly adapted to fairly heavy cutting on alloy steels. The 18-4-3¼ analysis is not generally used on steel machining, but is of real importance for operations on cast iron and non-ferrous machining. The additional Vanadium gives the high abrasion resistance that is necessary to have tools stand up in these materials, but there is a tendency toward crumbling of the tools if they are applied on alloy steels.

The purpose of adding Cobalt to High Speed Steels is to raise the temperature at which the tool softens under cut. This property is known as red hardness which implies that a tool with red hardness will still function even though it is at red heat. Operations that require a higher red hardness than is found in the 18-4-1 or 18-4-2 analyses are comparatively rare, but, for use on such operations, there are three rather common types of Tungsten High Speed Steel containing alloyed Cobalt. These are the familiar 18-4-1 with 4% Cobalt added, the 18-4-2 with 8% Cobalt added, and a super alloy of 22% Tungsten, 5% Chromium, 1½% Vanadium, with 12% Cobalt. The first two are usually specified on heavy duty applications where there is a large volume of stock to be removed with a consequent heating of the tool. The last mentioned analysis is interesting not only because it is the highest priced of the entire High Speed Steel field, but because it has physical characteristics that permit its use on cutting operations on which no other Tungsten High Speed Steel will stand up. It was originally developed in England for use in machining high manganese track sections. Since its price is almost four times that of the 18-4-1 type, it is obvious that it must be specified with discretion. Cobalt bearing steels have a common disadvantage in that they tend to decarburize during heat treatment. This is not a serious factor during their heat treatment with modern equipment, but has caused a great deal of trouble when methods of controlling decarburization were not available. Their price range is higher than materials without Cobalt additions so that they are used economically only on special purpose applications requiring superior tools.

Other Tungsten Types

There are two other Tungsten types that are normally of little general importance, but might be mentioned at this

time because of the large amount of armament work currently being placed. These are the 14-4-2 and the 14-4-2 with 5% Cobalt added. For some reason that has never been adequately explained, these steels seem to be very effective on heavy duty turning on armament and similar work, but have never had wide acceptance in other lines.

There is so much to be said about the newer High Speed Steel analyses and the modernized methods of handling High Speed Steels that the review of the Tungsten group has been necessarily very sketchy.

The manufacturers of Molybdenum High Speed Steels have been telling us for some years that the time was coming when the domestic availability of Molybdenum would be of vital importance to the American consumers of their product. Those of us who were active during the World War will remember how the prices of High Speed Steel skyrocketed because of the Tungsten shortage during those hectic years. Tungsten is produced in the United States in such limited amounts that we are at the mercy of the world market and may expect to see the price of Tungsten and hence the price of Tungsten High Speed Steels soar way above current quotations. If the unsettled foreign conditions continue for any length of time, or grow worse as many well informed men feel they are inevitably bound to do, we will get a lot of satisfaction from the work that has been done in introducing and stabilizing the Molybdenum High Speed Steels.

"Mo-Max"

The most widely used of the Molybdenum High Speed Steels is the Mo-Max type, containing 8% Molybdenum, 1½% Tungsten, 4% Chromium, and 1% Vanadium. It is a general purpose material with performance characteristics comparable with those of the 18-4-1 and 18-4-2 Tungsten Steels. In common with most of the earlier Molybdenum bearing analyses, this material is susceptible to decarburization during heat treatment, and must be treated in either controlled atmosphere or salt bath furnaces. This decarburization problem is no longer a disadvantage when hardening rooms are equipped to cope with it, as most modern installations are. Steels of the Mo-Max type are offered at a distinct saving in cost over either the 18-4-1 or 18-4-2 Tungsten types because of the much lower Tungsten content. Although the Mo-Max steels contain Tungsten, the ratio of 18% in the comparable Tungsten analyses to 1½% in the Mo-Max makes it possible to keep the price of the Mo-Max type practically independent of the price of Tungsten. As for performance, we can safely say that the Mo-Max steels may generally be expected to perform as well if not better than either the 18-4-1 or 18-4-2 Tungsten steels.

Six other analyses of Molybdenum High Speed Steels have progressed in their development to the point where they are now actively marketed by various producers. They are the results of several years of research with the purpose of developing analyses in the Molybdenum types that could be used in the place of the various Tungsten Steels. Another angle that has interested experimenters is the production of Molybdenum High Speed Steels that could be heat treated with no more care or equipment than is usually used with the Tungsten 18-4-1. How well these new steels have attained their goal remains to be determined in their acceptance by users to displace comparable Tungsten steels. They have passed rigid laboratory tests and have been successfully applied on many commercial applications, but their real value will not be known until consumers become better acquainted with them and have more experience in their use. They are all very interesting and will bear close watching as their use becomes more widespread.

One of the most widely advertised of the newer Molybdenum High Speed Steels contains 4% Molybdenum, 4% Chromium, 1½% Vanadium, and 5% Tungsten. This analysis minimized the decarburization problem by increasing the Tungsten content with a reduction in the contained Molybdenum and consequently is open to criticism as still dependent on a Tungsten supply for its manufacture. Whether that will prove to be a serious drawback remains to be seen in the future reaction of the Tungsten market to world conditions. Neglecting the economic considerations of such an analysis, it has been very well received in the limited field to which it has been applied.

The simplest of the Tungsten free High Speed Steels is that containing 8% Molybdenum, 4% Chromium and 2% Vanadium. This compares favorably with the Tungsten 18-4-1 in performance and has the advantage of being independent of the Tungsten market although it is susceptible to decarburization. Further commercial applications of this type must be made to determine its true worth in tools.

A similar Tungsten free steel has been developed and marketed containing 9% Molybdenum, 4% Chromium and 4% Vanadium. The only difference between this and the last mentioned analysis is that the Molybdenum content has been raised from 8% to 9%, and the Vanadium content has been doubled. This seems to give a high resistance to abrasion, making this material particularly adaptable for use on tools subjected to wear, such as broaches on non-ferrous materials. Although care must be taken in heat treating this material to prevent decarburization, it has very interesting possibilities and merits our attention as time permits further experience with it.

Cobalt is added to Molybdenum High Speed Steels to increase the red hardness just as we noted when reviewing the Tungsten types. An analysis is now on the market containing 8% Molybdenum, 1½% Chromium, 1% Vanadium and 2½% Cobalt. One of the most interesting things about this analysis is the addition of a small percentage of Boron which prevents decarburization and adds to the hardness without any appreciable sacrifice of strength. This Tungsten free material has been very successfully applied for use in taps, and reports indicate that it works out very well on this type of tool. We can expect to hear a lot more of this analysis in the future.

Another material that has had a fine reception is made up by adding 4% Cobalt to the Mo-Max analysis. This is designed for heavier duty tools than the straight Mo-Max, and is comparable with the Tungsten 18-4-1 plus 4% Cobalt.

The highest alloyed Molybdenum High Speed Steel is intended for heavy duty service, and has given a good account of itself on particularly tough jobs such as rough turning the tread of locomotive tires. This is a Tungsten free material containing 8% Molybdenum, 4% Chromium, 1½% Vanadium and 8% Cobalt with a Boron addition giving freedom from decarburization and high resistance to abrasion. It gives evidence of being a cheaper but an entirely satisfactory alternate for the highest priced Tungsten steels, but we have a great deal to learn about it and such knowledge comes only with long continued experiences in its use.

All of the materials discussed so far, both Tungsten and Molybdenum, have been forgeable in their annealed state and must be mill worked before their grain structure is suitable for use in tools. The many attempts that have been made in the past to produce a Cast High Speed Steel have met with very discouraging results because it seemed impossible to duplicate results. We have been experimenting for several years with a Cast High Speed Steel having a composition similar to the last mentioned Molybdenum analysis. We are producing commercially a material that has very interesting possibilities in that we anneal all blanks after the casting operation, and bring out the desired hardness and grain structure by means of a heat treatment following such machining as is necessary on the blank. This routine overcomes the objection inherent in materials that must be cast to shape and hence require a very expensive outlay in patterns and molds. We cast in either permanent or sand molds using either a centrifugal or gravity casting process. In the annealed state, this material is readily machinable, making it possible to cast it in

bars or sections that can be sawed or otherwise machined into whatever shape is desired. Heat treatments have been worked out by which Rockwell hardnesses ranging from C60 to C72 may be obtained to suit the individual application. It is available as welding rod for building up sections as desired. Its abrasion resistance is above that of any other High Speed Steel, making it a valuable material for wear resisting applications. Centerless Grinder Work Rests made of Cast High Speed Steel have proven very efficient, indicating its hardness and wear resisting properties whether in solid or welded sections. It has high red hardness and will stand up under high surface speeds without failing. We do not consider it a panacea, but prefer to introduce it very slowly in order that we may avoid the embarrassment always incidental to the application of new materials on work for which they are not suited. So far results have been very promising and we hold high hopes for the future of Cast High Speed Steels.

Up to this point in the discussion, we have considered only the materials available for use in tools. A review of the new High Speed Steels seems to indicate that all of the metallurgists have been busy conjuring up different analyses to confuse us, but they have not. Many of them have uncovered hitherto unrealized possibilities in the old familiar materials by improvement of mill methods and development of better heat treat procedure and equipment.

We are now in a position to measure and control heat treating temperatures much more accurately than ever before. Indicating and controlling pyrometers are available that relieve the hardener of any worry as to the actual temperature within the furnace. They control furnace temperatures with an accuracy that was not considered possible just a few years ago.

New Heat Treating Technics

Controlled atmosphere and salt bath furnaces are now almost universally used for hardening High Speed Steels. Analyses that would decarburize readily in open fires may be heat treated without appreciable skin in such equipment. It is interesting to note that the lower temperatures required for hardening Molybdenum High Speed Steels compared to those necessary for the Tungsten types is a decided boon to men in charge of the maintenance of heat treating equipment. In our hardening room, we try to keep individual furnaces operating on materials that are quenched from the same hardening temperatures to avoid damage to the refractories and the waste of heat that is part of frequently changing operating temperatures. Electric furnaces operating on Molybdenum steels normally have an element life about half as long again as those operating on Tungsten steels although the difference in operating temperatures does not exceed about 200° F.

Fuel fired furnaces have always enjoyed a distinct advantage over electrically heated furnaces because of the ease with which a valve may be manually or automatically varied to provide proportional heat input. Recent developments in the field of electric power input indicate that we may soon expect to see electrically heated hardening furnaces equipped with power input controllers that will automatically vary the input with the deviation of furnace temperature from the set control point. This will not only give an even closer control of operating temperatures, but will add to the life of heating elements and lessen the cost of maintaining very accurate heat treating equipment. And accurately controlled heat treating is of vital importance if we are to produce tools that will give uniformly good results.

Many extravagant claims have been made for the results obtained by using a secondary case treatment on hardened High Speed Steels. It has been our experience that such treatments are of value only on surfaces that are not disturbed by re-sharpening operations. We have had fine reports from tools that have had this treatment when used on abrasive materials where the scouring action of the chips was minimized by the extremely hard superficial surface produced on the exposed surfaces of the tools. Reamers seem to be particularly improved by secondary case treatments because the hard surface permits chip passage up the flutes without appreciable scoring.

I have mentioned these improvements in heat treating equipment and technique to bring to your attention the fact that our knowledge of how to get the best results from High Speed Steels is constantly improving. We have by no means exhausted the possibilities of improving the results obtained from the old analyses. We have a lot of work to do in that direction before we can sit back and feel certain that we know all that there is to know about their use. However, the knowledge that we are still at least partially ignorant of how best to specify and apply the older High Speed Steels should not keep us from lending a hand to those who are striving to produce new and better steels. All of the work that has been done on Molybdenum High Speed Steels is economically justifiable. There is a lot of consolation in having a suitable alternate for Tungsten available in our own back yard. The only way in which Molybdenum High Speed Steels can reach the state of general acceptance now accorded the Tungsten types is for us to build up a fund of information from actual experience with them.

What to Specify

As Tool Engineers, the primary question that we must be prepared to answer concerning High Speed Steels is "Will the job in question be adequately handled by a High Speed Steel, and, if so, what analysis should we specify for best performance and overall economy?"

There are many jobs that definitely cannot be satisfactorily handled with any High Speed Steel. For those, we recommend the use of either one of the Stellite group materials or one of the Carbides. Most of these jobs are not practical with High Speed Steel tooling because of excessive surface speeds, or very difficult abrasive conditions under which any High Speed Steel tool could not stand up. There are many tooling applications that are on the border line where it is difficult to choose between types of cutting materials. When working on one of these specifications, it is often necessary to lay out the proposed designs of tooling with different cutting materials so that unit costs may be worked out and the most economical material chosen. Fortunately at this moment, we are to devote our time to High Speed Steel tooling and do not have to worry about other materials. Granted that we are now concerned only with the specification of High Speed Steel on applications within the range of its possible economical use, we have still the problem of choosing a type of High Speed Steel from the many we have just reviewed.

It is only on long production runs that you have an opportunity to try several analyses and types of tools. Generally, you must specify a suitable tool material at the first crack, or be called on the carpet for embarrassing explanations as to why the tool cost is high. The best place to go for help in deciding the analysis to specify is the records of tool performance and costs on similar jobs in your own plant. Having decided on a specification, it should be clearly shown on the print of the tool or on all records if the tool is a standard item. If your tools are made in your own plant, this gives a permanent record of the steel that has been found best suited to your particular conditions and tool replacements can be expected to deliver equivalent performances. If your tools are purchased on the outside, the specification of the material desired results in each vendor quoting on a comparable basis with the knowledge that, if his bid is successful, he must furnish the tools as specified. It is not good business from a purchasing standpoint to limit your specification of a High Speed Steel to the product of any one steel manufacturer, if there are other manufacturers offering the identical analysis under other trade names. You specify the use of S.A.E. analyses on parts without any mention of the manufacturer of the material. Why is it not just as logical and practical to specify your High Speed Steels by analysis or

(Continued on page 42)

Cemented Carbides

A discussion of current carbide materials and their uses. Processes and technics in powder metallurgy have progressed in great strides the past fifteen years. "With carbides increasing in their value to American Industry . . . the way they have in the past . . . I am confident that we will be doing in four days what it now takes us five to do."

By W. G. ROBBINS
President, Carboloy Company
Detroit, Michigan

THE subject, cemented carbides, has been very extensively covered for many years. Consequently, I am not going to attempt to go back in history and tell you about its early inception, or very much about how it is made. I am going to assume to start with that you know most of that or have a general knowledge of it. I am going to try to confine my discussion to the current materials and something about their uses.

There has been a tremendous amount of research and development work on powder metallurgy in the last fifteen years. That work is worldwide and as a result of it processes and technics in powder metallurgy have progressed in great strides to the point today where we have, I believe, a new type of metallurgical endeavor which is destined to go far. The carbides represent only one phase of the metal powder field.

As to the present carbides, the current ones that are available, I must tell you to start with that I am speaking here of the carbide industry as a whole. Cemented carbide products are divided mainly into two groups: The straight tungsten carbides, as we call them, and the mixed carbides. The straight tungsten carbides are made with tungsten carbide as the main element with a binder, usually cobalt. The mixed carbides are made with tungsten carbide, and a small percentage of one of the other carbides, either titanium or tantalum, and in some cases both. In most cases the binder is cobalt.

Three Principal Groups of Carbides

In the first group, tungsten carbides, the uses have been mainly confined to applications of iron and non-ferrous cutting. They are quite well known. The mixed carbides have been confined in their application mainly to steel cutting and the cutting of irons containing a high steel content. They are somewhat newer than the straight tungsten carbides. In that connection, I want to leave with you this one point: That we have known here in this country tantalum carbide, titanium carbide and tungsten carbide. Those are the main carbides. There are some others. I want to point out, however, that all of those names do not imply exactly what they are. They are all predominantly tungsten carbide. The titanium or the tantalum or both are added to achieve characteristics which the industry hasn't been able to incorporate in a straight tungsten carbide mixture. Designation of these grades as "Tantalum carbide", or "Titanium carbide" is a good way, however, to describe the differences between the materials but I don't want to leave the impression that there are straight titanium carbides or straight tantalum carbides in use in this country, or, for that matter, in any country in the world.

Large Number of Grades Originally Offered

At the very inception of all this new carbide industry there was a great scramble in the field upon the part of manufacturers to produce grades of material which would in turn do specific jobs. This resulted in a great number of grades being offered by all manufacturers. I don't know how many grades there are available in the American market today but a few years ago there were something over a hundred grades of cemented carbide available for sale. This resulted in considerable confusion and retarded the use of the material.

However, it had a favorable aspect in that the great amount of research and development involved led to the highly efficient grades on the market today. The reason why so many grades were offered is mainly that it was thought a different grade of material was needed for each different job. Also, because the early application of carbides was devoted almost entirely to high production, single purpose jobs, it was possible to produce a given grade for a given job to get an increased performance.

Four Grades Do Most Work Today

The situation now is considerably different but still quite confused in the minds of the users. Let me summarize it in this way: That four grades of carbides today do about 85 to 90 per cent of all the work that is done. That percentage is quoted from my company's own figures but I have reason to believe that it is true of the carbide industry as a whole.

The other interesting fact is that out of those four grades of carbide, two grades actually do a great part of the total work. So when we come right down to the final analysis we can say that two grades of carbide out of this 100 that I mentioned originally are doing the main part of the work. One of those grades is for steel, and one for iron. I will go into that a little further, but I want to stop here to comment on Mr. Chapman's, what shall I call it, commission to the tool making industry to manufacture a tool material which will do in speeds and feeds what carbides currently do to machine the cheapest crankshafts.

That is a great ambition, and we would like to be able to do it. However, all I can say is that we are struggling with a type of metallurgy that doesn't lend itself to strength such as would be required to do that. But I must also add, that the strengths of the current carbides in the American market today are somewhat on the order of three to four times what they were eight years ago. If we can forecast for the future and say that the improvement in carbides will be as great within the next ten years as it has been in the past eight, we may be able to do something for Mr. Chapman. However, the very thing he has pointed out has been the thing which has brought out all this research and development in this field.

Early Applications Largely on Quantity Production Jobs

At the start, referring now to usage, tools were used largely on single purpose high production jobs, and mainly in the cast iron and non-ferrous fields. This was necessarily so because the economies were very easy to prove and because the applications of the materials were much easier in those fields than on the more difficult alloy steels. The cost of carbides was high. Consequently, the most likely jobs had to be considered first. Furthermore, there was an absolute lack of education and information regarding the grinding, fabricating of the carbide tools and their usage. Therefore, the more simple jobs were the ones that came into use first, and as time passed and many of these problems of application, use and education were solved, we find the carbides farther into the various cutting fields, going further and further, reaching out into alloys that a few years ago wouldn't have been considered possible.

I think that in order to throw this thing in its proper relation I shall tell you something about the consumption of the

material in the United States. In 1939 the consumption of carbide in the United States was more than ten times greater than in 1935. Another interesting fact is that the consumption per MONTH in 1939, and for that matter, 1940, is equal to approximately the YEARLY consumption in such years as 1931, 1932, 1933 and 1934. So that you can get some idea as to what the solution of these various educational problems in the use of the material has done to the consumption of carbides in this country.

The factors that, in my opinion, have resulted in the increased use of carbides are, first, broader application of the product. Secondly, and perhaps of even greater importance, is the simplification of grades so that carbides may be used more broadly without requiring an unwieldy inventory of many diversified grades. Improved machine tools also have had a great part to play in the use of carbides recently and in their increased consumption.

At the very start these fabulous speeds and feeds that were quoted so freely by many of us were impossible of achievement because of machine tools. I might also say here that some of those things were badly overstated because of lack of knowledge. But the present day machine tools in the United States are adequate in every respect to handle carbide tools the way they should be handled.

Domestic Machine Tools Entirely Adequate for Efficient Carbide Tool Use

There has been a great deal of discussion in the carbide industry as well as outside of it, I believe, about our American machine tools compared to foreign machine tools in the use of carbide. Three years ago I had the privilege of visiting Germany for a period of about seven weeks, to investigate their use of carbides and the machine tools available there for carbide tools as against the ones available here. I came back more than ever convinced that our machine tools were adequate for efficient carbide tool use.

I want to pay tribute to the machine tool industry for the way they have kept pace in the difficult job they have had with the new and improved cutting materials. The better grinding and service techniques that have been developed and are common in use today also account for another great step forward in the increase of the carbide.

Multiple-Point Carbide Tools

A word as to the types of tools that are manufactured today: It took many years to develop manufacturing methods that would adequately do the job of fastening carbide tips to tools. It is very simple and looks very easy and in lots of cases is. But the application of those pieces of carbide for a wide field of use and on many types of tools has its problems. Great strides have been made in this work, particularly during the last three years. "Particular", or "multiple point" tools have been retarded materially due to poor manufacturing information and just lack of experience in using carbides on those types of tools. They are going forward rapidly, and we find today a great many such tools being made with carbide at a total overall price that is actually less than those made from other types of cutting materials. That is quite a broad statement and it doesn't apply to all types of tools, but it does apply to some.

The carbide content in such tools is very, very low, so that the cost of the carbide as it is employed in the tool is nil. The labor to make the tool, however, is the governing factor. Methods have been developed to manufacture such tools in standardized classifications, today to such an extent that that labor is reduced so that it is an easier job to make that type of tool, than, for example, a high speed steel tool. The net result is that that tool sells for less money than it would if made of other types of material.

Wide Range of Multiple-Point Carbide Tools

Many types of multiple-point carbide tools are common today. Reamers, inserted blade as well as solid and adjustable types of reamers, are, in my opinion, coming rapidly into their own, particularly in airplane manufacture in the use of silicon aluminum materials as well as magnesium. Very much the same applies to spot facers—counterborers, drills. I should qualify the latter by saying that twist drills have been used largely for non-ferrous materials. However, recently a twist drill manufacturer has become interested in the possibilities of carbide twist drills for broader use. I am confident that somewhat more development in that field will produce twist drills that will do comparably the same as carbide turning tools are now doing in their specific fields.

I hope no one will leave here and quote me as saying that twist drills would drill manganese steel, and everything else at fabulous speeds. Their use is at present confined largely to the field described. That is important. One other type of drill should be mentioned here: The carbide flat drill for use on masonry materials such as concrete. This has enjoyed wide use in the construction trades and for industrial plant maintenance.

Taps: Taps of solid carbide have been ground and are in use today. They have a very interesting application in the ceramic field. They, too, have a specific field, and they are not to be applied broadly. Ceramics, hard rubbers, aluminums, bakelite, for this class of materials carbide taps are today commonly in use and doing a wonderful job.

Thread gauges made of carbide with the threads ground in the solid carbide are also very common, and have a marvelous field of use in gauges in the higher abrasive types of materials. Gauges of all types are rapidly going forward.

Burnishing tools, particularly in the last two years, have come into their own. Lots of parts that were formerly finished by precision machining are being finished by burnishing, and producing surface conditions and physical characteristics felt by the metallurgist to be particularly desirable.

I hardly need to mention milling cutters except to say that milling cutter manufacturers have developed new and interesting heads in which to incorporate carbide which take into consideration factors necessary to produce a successful carbide milling cutter. We were always aware of the possibilities of carbide in milling. However, originally it was necessary to apply carbide on head available at that time. Today a great deal better performance can be attained with the use of the new heads that are available.

Broaches: Again a tool that has a limited use, but at the same time one that performs a very successful job in its field, particularly on surface broaching in the finishing positions. Round broaching of bearings is now a common procedure and has done away with a great amount of work and effort formerly required by the old methods of manufacturing that bearing.

In the foreign countries they considerably exceed us in the amount of carbides used on steel cutting. We have recognized this and have made an investigation to find out why. We have found it is not because of new and different carbides available there that we do not have here. It is instead due to the various different ways in which carbides are used there and here, and the various ways in which they use their parts.

I will briefly enumerate them: In this country we have multiple tooling to a large extent on all our production work. There they have single tools in operation mainly. That is largely their field. That is greatly in favor of a carbide tool. Smaller tools in cross-sectional shank size are used here, whereas over there they are much larger. That also retards the use of the material here. A great many more tools per setup are required to do the same job here.

Mainly, the whole thing gets down to this, that here we put our money in machinery to do the job because of labor costs, there they have not gone that far. Because of their cheap labor those things have worked in favor of carbide tools tremendously. Let me say that within the last two years particularly, the use of carbide on steel has greatly increased. At the present time, currently, five to seven times the material for steel cutting is being sold and used in this country than was used two years ago. So you can see

a tremendous step-up in the machining of steel with carbide.

The reasons mainly are: We have better grades available, better machines, greater demand in production, particularly at the present time, more education in the use of those tools, and particularly for competitive reasons a greater urge to reduce cost per piece produced.

Conditions Necessary to Cut Steel with Carbides

Steel cutting tools are generally more difficult to apply than the iron cutting tools but with the information that is available today we don't consider that a great factor. I will enumerate the things that we think are important in the application of steel cutting tools: The horsepower of the machine is important because the tools must run faster and a great number of disastrous results have come from using tools on under-powered machinery. The design of the tools, the rakes and angles, the clearance angles, are all important, but they, too, have been simplified and are pretty much a standard proposition today.

Coolants have some effect. Abroad there are no coolants used. In this country our machines are all equipped with coolants. Consequently, we must do a different kind of job to use carbide tools here than they do there.

Chip room in the machine is a very important thing. Chips come off of these carbide tools at a high rate and our designers not having that problem before them when they designed the machine have not incorporated chip room enough in many machines to use carbide tools successfully. So it becomes a little bit more of an engineering job to set a carbide tool to use on some of our more intricate multiple tool machines. Chip breakers to enable us to dispose of chips properly, I think, is perhaps the most important requirement in this field.

All of this information and all of these things that I have enumerated are available in engineering pamphlet form containing recommendations from our company. If you are interested, I would certainly suggest that you get hold of one of these and read it, because steel cutting has become quite simplified today. A great part of this information has been standardized in a chart which I want to show you, because I believe it answers many of the things that we have all been trying to obtain in the use of carbides in the last five or six years on steel.

This chart, Figure 1, is for average work and quantity production jobs. This is only a section of the chart. For a given steel and feed and depth of cut it lists recommended speeds and carbide grade. A means of calculating horsepower required is also included. Let use take one example quickly and see what this tells us: We will say we want to machine an S.A.E. 1030 carbon steel taking a $\frac{1}{8}$ depth of cut at a 1/32 maximum feed. The chart shows that the recommended speed to start that job is 275 feet per minute, and the recommended grade to start is 78-A.

Those grades apply to the Carboloy Company's grades. Over in the far right it gives you the front clearance angle to use on the tool and the side clearance. This must be said: That that chart, such a thing as that, in something that is not a science but rather an art, can never be 100 per cent correct always. But it has been arrived at after a great amount of experience, not necessarily all tests, real experience. You will find that the grade recommendations are conservative and that the speeds are very conservative.

You will note that an additional grade of material, grade 78, is also listed. That is for ideal machine conditions or for longer life between tool grinds. Many plants have used this chart in the past several months, and it has been the means of solving a great part of their trouble. They no longer say to us, "What grade shall I use? What speed shall I use? What feed shall I use?"

I would like to say a few words about chip breaking because it is a subject about which we get most questions today. With but few exceptions some provision for chip breaking must be made. Without this the chips are a constant hazard to the operator and a detriment to efficient operation. It is, of course, generally true that a tool without a chip breaker is a most efficient tool as far as the tool life is concerned. However, inasmuch as it must be provided in some way a compromise must be reached and we find chip breaking has been accomplished in three different ways: First, by directing the chip itself into a stationary object or in some cases a revolving object on the machine; second, by using a clamping fixture on the top of the tool such as a spring clamp so that the chip is directed back into the clamping fixture and is thus broken; and third, by grinding the chip breaker in the tools. The third method has been found to be the most satisfactory, and in the third method there are three types: One called the gullet type of chip breaker which is a groove ground into the top of the tool slightly in from the cutting edge and parallel to it; the second, a shelf ground on the cutting edge and parallel with it; and the third, an angle ground obliquely across the front of the tool.

Generally, the angle type of breaker has been found to be the most satisfactory and since a very small deviation in the chip breaker can either make or break the performance of the tool, or particularly the handling of the chips on the job, it has been important to reestablish these chip breakers once the tool has been reground. This cannot be done freehand so far as I am aware and ever get the same chip condition twice. Consequently we have been working in conjunction with a machine builder to produce a machine that would do this simply and easily.

Figure 2 shows this machine. It is merely a small hand surface grinder with a fixture to hold the tool.

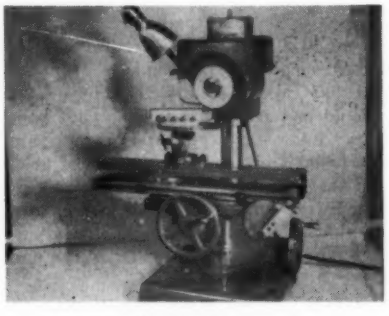
Figure 3 shows the fixture itself. This illustrates how simple it is to set a tool for any given chip breaker. There are three settings, and there is a chart supplied with the machine which will tell you in what position to set all three to grind a given chip breaker. With this chart it is a very simple thing to duplicate any chip breaker.

Figure 4 shows a closeup of the tool in the fixture. The wheel is a diamond wheel, coated on the periphery only. An angle chip breaker is ground in the tool. On that particular tool, that chip breaker was ground in five minutes and thirty seconds, of which four minutes and thirty seconds was setup time. In other words, the chip breaker was ground in

FOR AVERAGE WORK AND QUANTITY PRODUCTION

See opposite page for use of table. IMPORTANT-For Steels over 400 Brinell see note on opposite page.		POWER CONSTANT	Cut 1/8 to 1/4	Feed 1/32 Max.	Cut 1/16 to 1/8	Feed .010 Max.	IMPORTANT for tool angles	
			F.P.M.	Grade	F.P.M.	Grade	Front Clearance	Side Clearance
CARBON STEEL	S.A.E. 1010-1025	6	150–350 300	78A 78	200–600 400	78 78A	6-12 8	6-12 8
	S.A.E. 1030-1095	8	150–350 275	78A 78	150–350 275	78A 78	6-10 8	6-10 8
	S.A.E. 1112-1120	6	150–350 300	78A 78	200–600 400	78 78A	6-12 8	6-12 8
ALLOY STEEL	S.A.E. X1314-X1340	8	150–350 275	78A 78	150–350 275	78 78A	6-10 8	6-10 8
	S.A.E. T1330-T1350	9	150–350 275	78A 78	150–350 275	78A 78	6-10 8	6-10 8
	S.A.E. 2015-2320	7	150–350 300	78A 78	150–350 300	78A 78	6-12 8	6-12 8
	S.A.E. 2330-2350	8	150–350 300	78A 78	150–350 275	78A 78	6-10 8	6-10 8
	S.A.E. 2512-2525	10	150–300 250	78A 78	150–350 275	78A 78	6-10 6	6-10 6
	CAST STEEL STAINLESS STEEL	9	150–300 250	77A 78A	150–350 275	78A 78	6-10 6	6-10 6

FIGURE NO. 1



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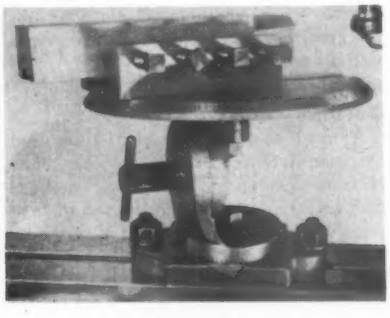

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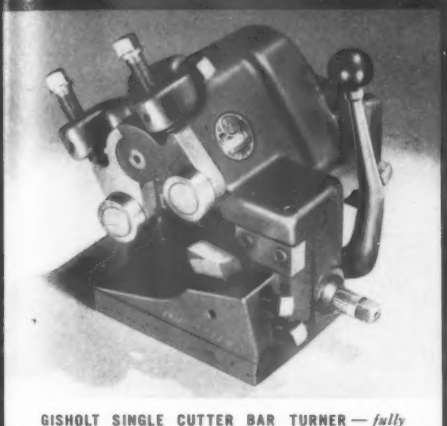
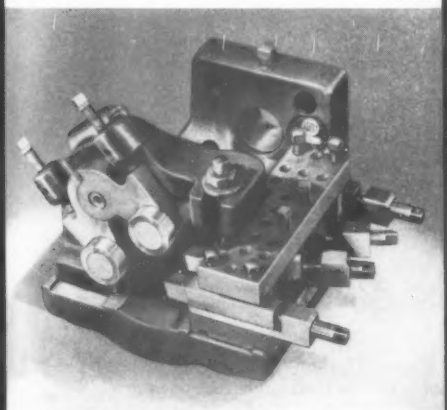


GISHOLT SINGLE CUTTER BAR TURNER — *fully enclosed to protect working parts against damage by chips and dirt.*



GISHOLT MULTIPLE CUTTER BAR TURNER — *for turning two, three, four or more diameters at the same time.*

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Among the design features of these tools which contribute to their ability to make heavy high-speed cuts and still maintain exact dimensions and fine finish are rigid steel construction, hardened steel rollers mounted on roller bearings, and adjustable roller arms that attach securely to the block. These can be set to lead or follow the work. Set-up operations are facilitated by the micrometer adjustment screws on the tool blocks.

These catalogs cover Gisholt Standard Tools for use on Nos. 3, 4 and 5 Ram Type Universal Turret Lathes, and 1L, 2L and 3L High Production Turret Lathes. Write for your copy, specifying for which machine.

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the tool in one minute. The important thing is that with that setting and with the chart to establish the setting on the same type of tool, every time you send the tools to the tool crib and ask that it be ground a given way you know it will come back with the exact chip breaker you want.

While that sounds simple, it has been one thing that has confounded the whole world on the use of carbide tools on steel. In all my experience in Germany I saw no one who had completely solved the problem of chip breaking universally, and I question whether it ever will be solved. But I believe this procedure is simple enough so that it can be dismissed as the major problem for some time to come.

The general use of standard tools should be mentioned here. Standard tools are available in quite a number of styles and sizes. Since carbides have worked so well on single purpose production jobs they have become known as that kind of tool but that is far from the case. By the use of standard tools and proper grinding, standard tools can be used as general purpose tools throughout a plant. That has been done and successfully done in a great number of cases in the past few years. I give you as an example the Warner & Swasey Company and the Bullard Company, and I want to refer you to articles in the Iron Age Magazine of October 26, 1939, by Mr. E. C. Bullard; and an article in the American Machinist, February 7, 1940, by Mr. W. J. Berger of the Warner & Swasey Company.

Briefly, let me say that these concerns have been able to apply carbide tools generally on a large number of jobs by the use and application of standard tools ground to fit the job. There was a time when it was generally felt that once you get a carbide tool in the right shape it was impractical or uneconomical to regrind it to make another tool out of it in the same way you would with high speed steel. That, too, is a problem that has really been solved. I want to show you how quickly and easily you can take a carbide tool in the same way you would take a stellite or high speed steel tool and grind it to a given shape to fit a given job, from one of the existing standards on the market today.

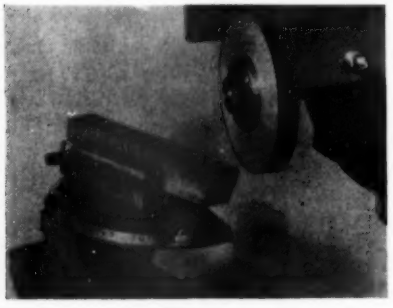

FIGURE NO. 4

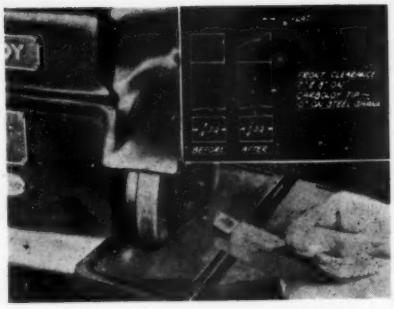

FIGURE NO. 5

FIGURE NO. 8

FIGURE NO. 6

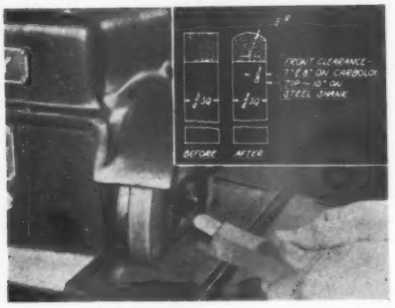

FIGURE NO. 9

FIGURE NO. 7

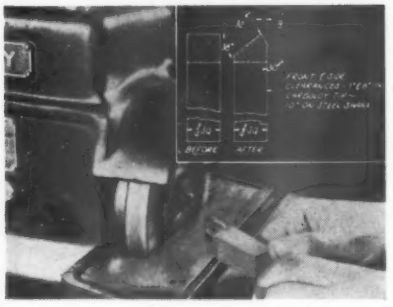

FIGURE NO. 10

Figure 5 shows a ¾" square style 1 standard tool. At the left side of the sketch is shown the standard tool before grinding. It has the carbide type across the front. On the right is the shape to be ground in the tool. Figure 6 shows the first operation in grinding, roughing on the periphery of a silicum carbide wheel, 60 grit.

Figure 7 shows the semi-finishing operation on a cup wheel, 120 grit. Figure 8, demonstrates the finishing on the cup surface of a diamond wheel. That tool was completed in four minutes and fifteen seconds. Two minutes and forty-five seconds was spent in the final sharpening.

Figure 9 shows another shape in which a style 1 tool can be ground. This is ground with a radius on the front in five minutes and fifty-five seconds, one minute and five seconds of finishing time.

Figure 10 shows the same style of tool ground as a boring tool. The grinding time was four minutes and forty-five seconds, fifty-five seconds of which was spent in sharpening the tool on the diamond wheel.

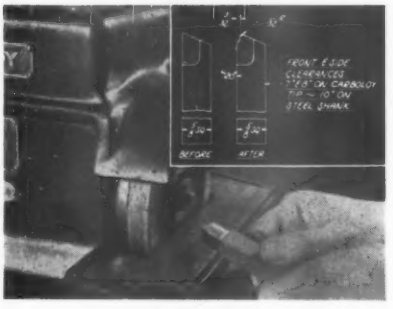

FIGURE NO. 11

Figure 11 shows a style No. 4 turning tool after the lead angle had been ground in. The grinding time was four minutes forty-five seconds, fifty-five seconds of which was spent in sharpening tool on diamond wheel.

I cannot impress you too strongly with the fact that the greatest economies from the use of carbide tools are only going to come from using those tools generally. Naturally, I am not proposing that they can do everything. They cannot. But they can be used as general tools through-

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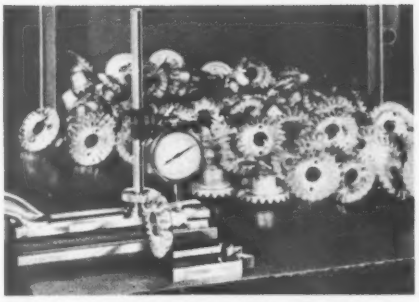
STARRETT TOOLS



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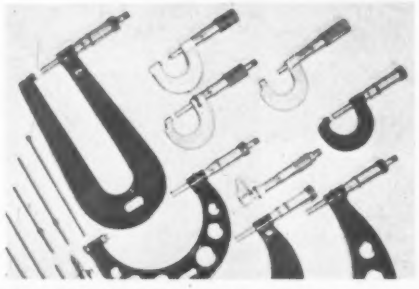

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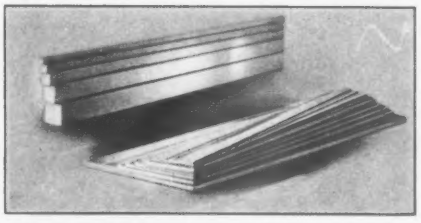

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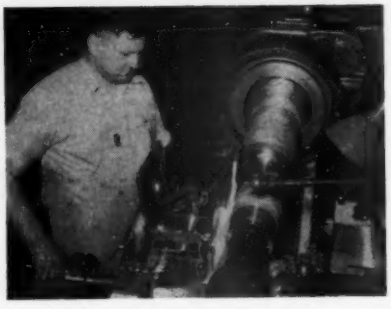
FIGURE NO. 12



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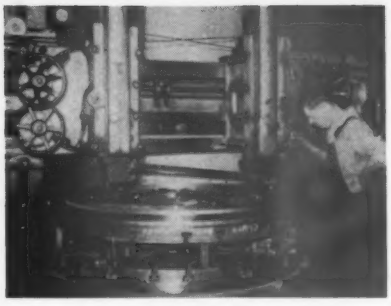

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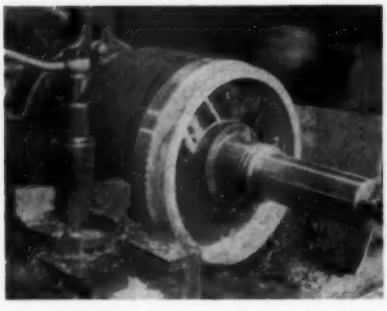


FIGURE NO. 13

FIGURE NO. 16

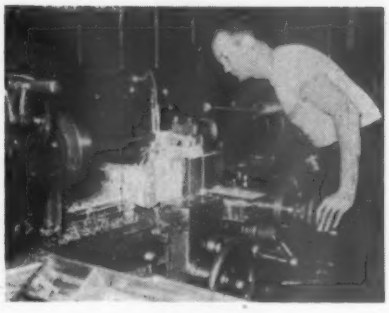
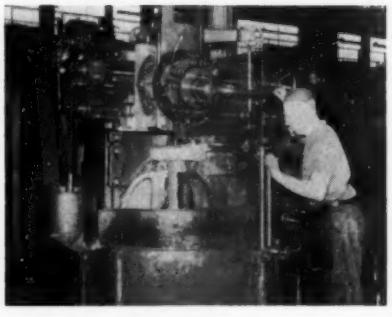


FIGURE NO. 19

FIGURE NO. 14



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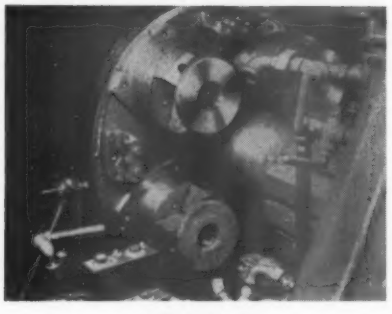

FIGURE NO. 20

out a shop today rather than as single purpose high production tools.

I would like to conclude with a few illustrations of some interesting steel cutting jobs and then I will be through.

Figure 12—I said that steels have not been cut too long with carbides, but that is really somewhat wrong because we cut steels with carbides in the very inception. This is a job that was run in 1928, the General Electric Company facing a steel flywheel. It is still running.

Figure 13—This is also one that was started in 1928 and it is pretty common with all motor manufacturers today, turning silicon steel punchings in an induction motor rotor.

Figure 14—Here is a 1936 application of carbide tools to steel turning, turning chrome nickel molybdenum bucket wheels up in the General Electric Plant.

Figure 15—Here is a modern, very current application of carbide on steel turning. This happens to be one of the Warner & Swasey Co. on an S.A.E. 1050 hand forged spindle, surface speed 175, feed. .016, depth of cut, ½ inch; time with carbide, one and one-tenth hours; time with high speed, two hours. The finished turning on that same thing was done in one hour versus three hours.

Figure 16—This job was a 2315 idler shaft of this company, speed, 245; surface feed .015; depth of cut, .046; time, .29 hours with carbide; a half hour with high speed steel.

Figure 17—Turning an S.A.E. 1045 spindle at the Bullard Machine Tool Company at a speed of 282 feet per minute; feed, .018; depth of cut, 5/16; time with carbide, 18 minutes; high speed steel, 55.

Figure 18—Turning and facing 60 to 70 carbon steel clutch rings at the Bullard Company: Speed, 230 feet per minute; feed, .018; depth of cut, 3/8. Carbide tool reduced the cutting time 30 minutes per ring.

Figure 19—Turning steel shaft 200 surface speed; feed, .018; depth of cut, 3/18.

Figure 20—Rough and finished turn in faced clutch plates, part of a Cleveland Automotive Parts Supplier: surface speed, 185; feed, .018; depth of cut, 1/16; number of pieces per grind, 250; machine output per hour, 50. The comparable machine output per hour with high speed steel was 33.

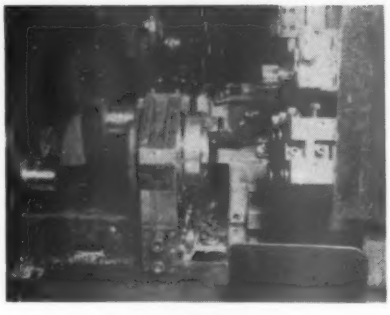

FIGURE NO. 21

Figure 21—Turning the end of a crankshaft in automotive manufacture.

Figure 22—Finished boring connecting rods: Pretty common operation today,

(Photo of Fig. 22 on page 52)

(Continued on page 52)

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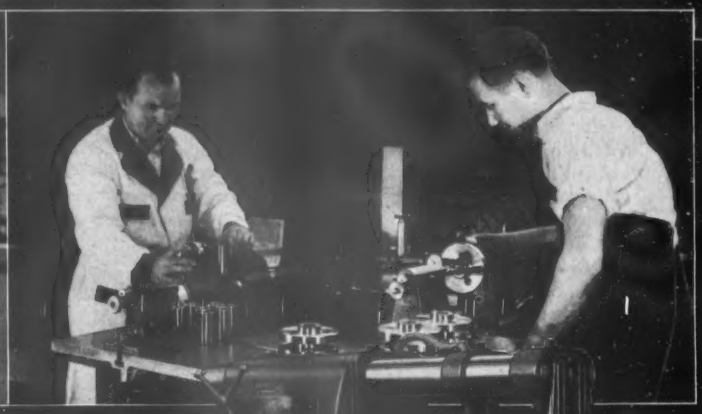

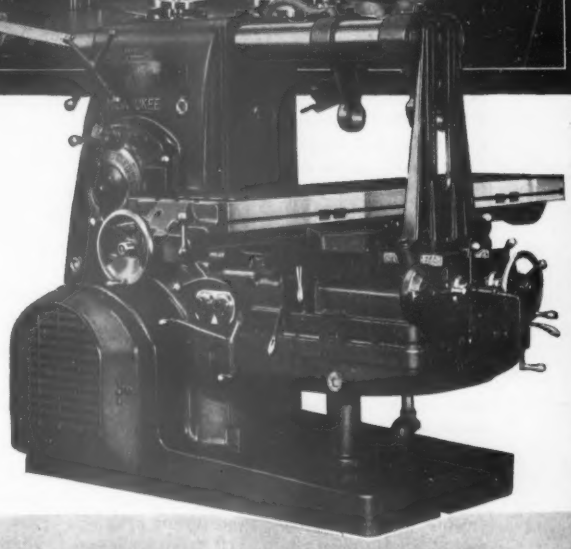

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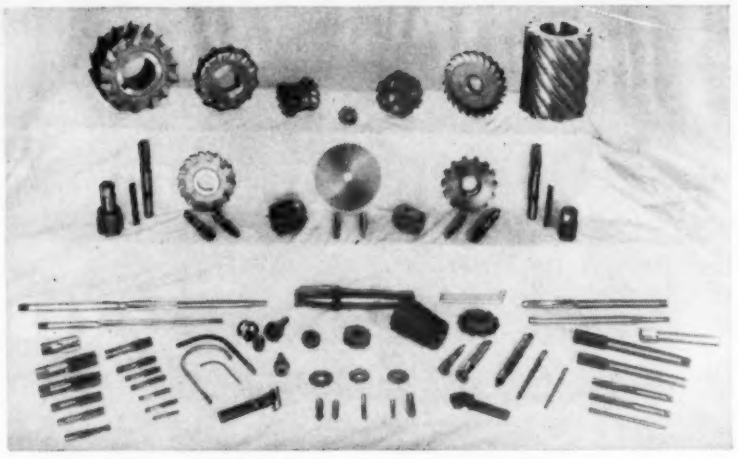


HIGH SPEED CUTTING TOOLS

Their Selection and Care

By A. H. d'ARCAMBAL
Pratt & Whitney, Div. Niles-Bement-Pond Company
Hartford, Connecticut

THE three speakers preceding me on today's program (Messrs. Chapman, Gorham and Robbins) have clearly demonstrated that real economy can and is being effected in our metal-working plants through the use of tools properly designed for each job and fabricated from material best suited for the work being machined. Many plant executives have with justifiable pride informed your speaker recently that through the proper selection, use and care of the cutting tools daily employed in their plant, thousands of dollars yearly have been saved in their tool costs, together with a marked improvement in the quality of their product. It therefore would seem fitting to briefly discuss this subject.

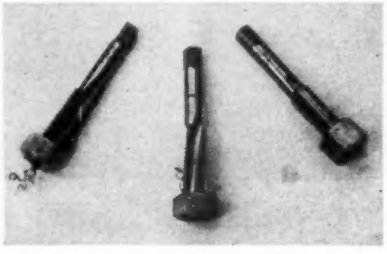
Selection of Tools

Materials having vastly different machining properties, such as the plastics, aluminum alloys, magnesium, brass, copper, low and high tensile irons, soft steels, heat treated alloy steels, stainless steels, etc., today are being machined on a tonnage basis, necessitating in many cases the use of tools especially designed for the job. Regularly listed tools while giving good service on some of the ordinary non-ferrous and ferrous jobs, would not perform efficiently on other kinds of materials commonly used today.

To cite an example, milling cutters designed for use on magnesium alloys must have large peripheral clearances, high rake angles, exceedingly smooth tooth faces and ample chip room. It is the usual practice to furnish cutters for this material with only half the number of teeth usually found on so-called stock cutters or general purpose tools, thus providing ample chip room. All tools used on these magnesium alloys must be exceptionally free-cutting, reducing friction to a minimum because of the fire hazard.

An investigator recently reported that magnesium is by far the freest machining material of all commercial metals and alloys. In his article he presents the following figures relative to machinability of different materials: Magnesium—100, Aluminum — 55, Brass — 45, Iron — 30, Medium Carbon Annealed Steel—20.

As another example we might cite the commonly accepted practice in regard to the design of cutters used on alloy steels, heat treated to a high Brinell hardness range. Cutters for machining this hard abrasive material are provided with a lesser amount of rake and relief than the standard design cutter, the number of teeth and other features being the same.



Effect of tap design on chip disposal. Special pointed tap on left forces chips ahead of tap. Right hand spiral fluted tap in middle brings chips up—out of the hole. Plug tap on right leaves portion of chips between tap and work.

It is interesting to relate at this time the many factors that must be considered when making a tap study for a particular job. The Tool Engineer must decide as to whether carbon or high speed steel taps are most suited for the job in question, depending on the material being machined, type of machine employed and the production requirements. He must then decide as to whether the taps if made of high speed steel should be cut

Profile milling alloy steel master rods heat treated to a hardness exceeding 300 Brinell.

"Real economy can and is being effected in our metal-working plants through the use of tools properly designed for each job and fabricated from material best suited for the work being machined. Many plant executives have with justifiable pride informed us that through the proper selection, use and care of cutting tools daily employed in their plants, thousands of dollars, yearly, have been saved in tool costs, with a marked improvement in quality of the product."

Stepped up production

300%

with FIRTHITE *Cutting Tools!*

Boring, turning and facing an aluminum-bronze bearing, 7½" O. D., 12" long, 5" bore, at 130 R. P. M.

Courtesy of the Sommerfeld Machine Co., Braddock, Pa.

PROBLEM: —Production of tough aluminum-bronze bearings delayed by ordinary tools that limited lathe speeds, required 3 grinds per bearing, resulted in boring inaccuracies.

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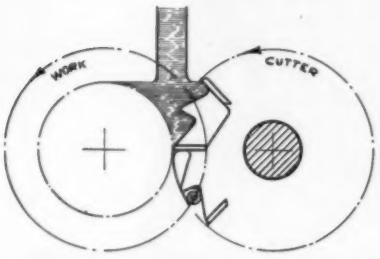
Fig. 1

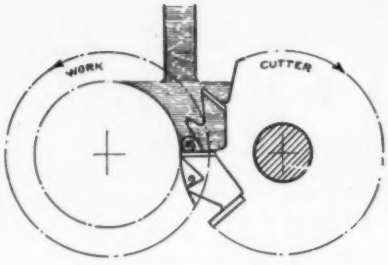
CONVENTIONAL METHOD OF MILLING



APPROX CHIP FORM

Fig. 2

UNCONVENTIONAL METHOD OF MILLING

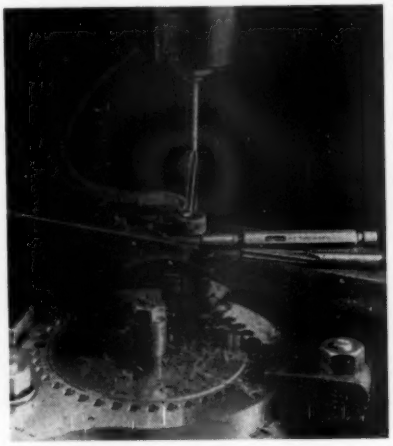


APPROX CHIP FORM

or ground thread, th.s decision depending on the gage fit required. Other important factors are the number and shape of flutes, chamfer and thread relief, rake angle, style of tap such as plug, bottoming, spiral pointed, interrupted or full thread, etc. One of the illustrations in this article clearly shows the chip disposal obtained with taps of various styles. This photo clearly shows that spiral pointed taps should not be used on blind hole jobs unless the hole is drilled considerably deeper than the threaded section as these spiral pointed taps force most of the chips ahead of the tap. On many through hole jobs the spiral pointed tap gives by far the best results, depending on the depth of thread, hardness of the material being machined, etc. Spiral fluted taps are rarely used by industry today although on some difficult blind hole jobs a right hand tap with right hand spiral flutes performs in a very satisfactory manner due to taps of this design bringing the chips up out of the hole; in other words, perform exactly opposite in regard to chip disposal as the spiral pointed tap.

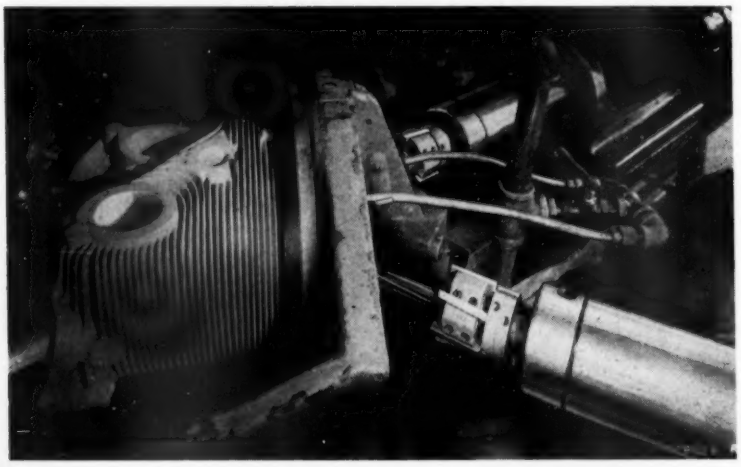
Many companies have shown a marked savings in their reaming costs, as well as producing smoother and more accurate holes through the use of high speed steel reamers of the correct design for the job, these reamers being given a surface hardening treatment. I recall a case in one of the large Eastern industrial plants some months ago where forgings made of alloy steel with Brinell hardness in the neighborhood of 280 were being machined on a production basis, using straight fluted reamers with the ordinary heat treatment. By changing over to a right hand spiral fluted reamer, giving these reamers a special surface hardening treatment, a 450% increase in the number of holes was obtained from these spiral fluted reamers as compared with the straight fluted product, together with a better finish and greater accuracy. On this particular job alone the manufacturer saved close to $3,000 yearly in the actual cost of reamers.

The manufacturers of precision cutting tools have experienced Tool Engineers in their employ who are very glad to cooperate with the manufacturers in regard to selecting the proper design of tool for the job. It always is preferable to use regularly listed tools wherever possible,



Left—Reaming alloy steel propeller brackets treated to a Brinell of 320 using right hand spiral reamers given a special hard surfacing treatment. Hole tolerance .0005". *Right*—Machining magnesium castings. Photo, courtesy of Aluminum Company of America.

Below is shown a combination reaming job on Aluminum alloy cylindrical heads. High finish and close tolerances are essential on this job.

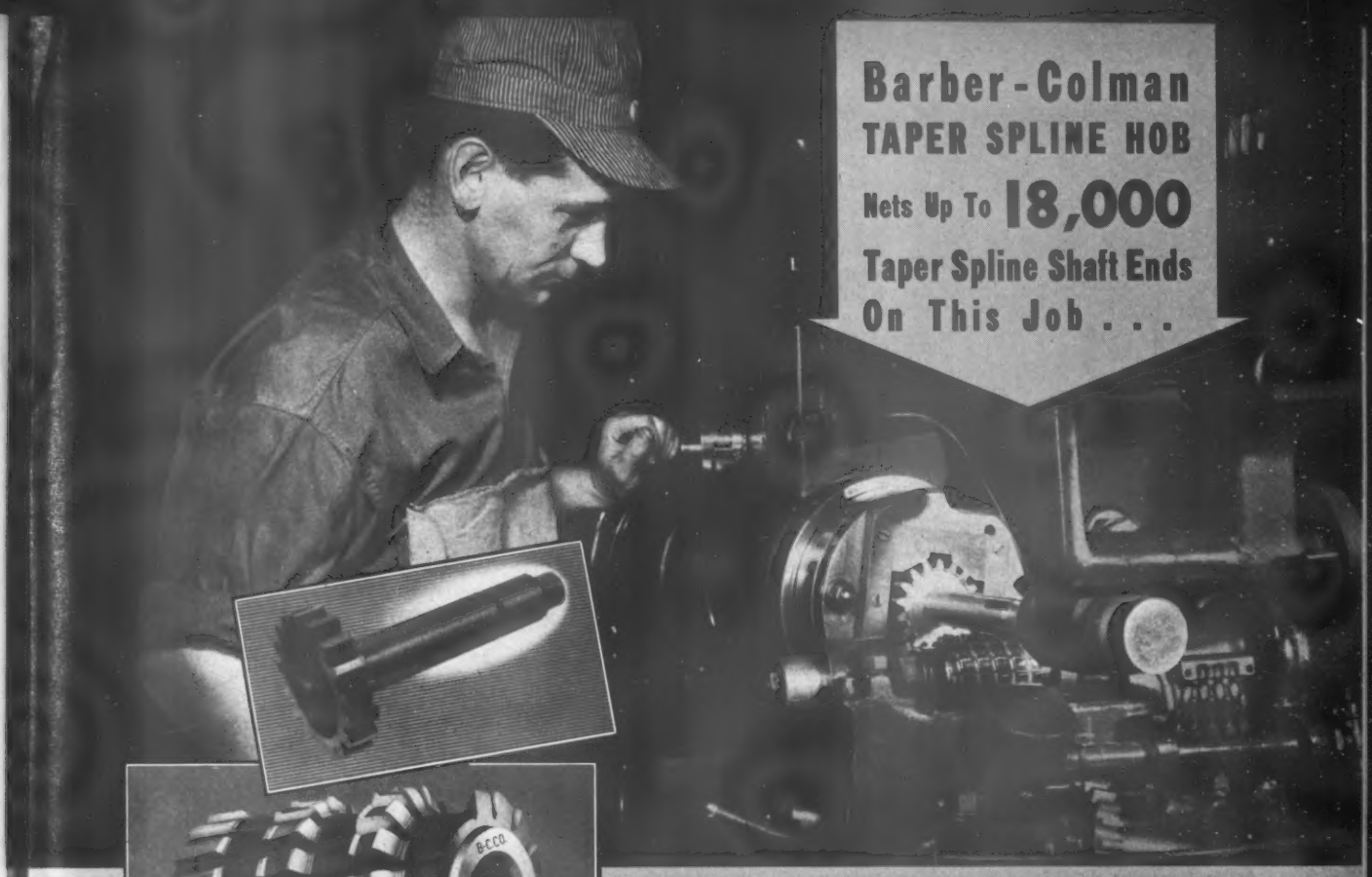


but as stated a few minutes ago, some materials being machined on a tonnage basis require specially designed tools for efficient operation.

Use of Cutting Tools

Many of our industrial plants have made a careful study as to the proper use of cutting tools such as the correct type of machine to employ, properly designed holders, use of the proper speeds, feeds, cuts, etc. Many tables have been published showing the recommended speeds, feeds and cuts to employ on various types of tools used on different materials, these tables however being more or less of a guide but not applicable to all shops. Conditions vary so from shop to shop that the information given in these tables should be used merely as a starting point, determining by actual tests as to the proper speeds, etc., to be used.

We have found many cases where high



Get More Hob "Mileage" On Any Job with BARBER-COLMAN HOBS

Above: Barber-Colman Taper Spline Hob, for use on the Barber-Colman Type T Hobbing Machine. Larger teeth first take out metal between keys at the shaft end. As cutting progresses, the hob feeds diagonally across the shaft. This brings shorter teeth successively into the cut, making the keyway gradually shallower until taper is complete. The mating part is produced by broaching a taper reamed hole.

Data on this Job

Name of Part — Brake pulley shaft and gear.

Material — S.A.E. 5140 steel; 160-175 Brinell hardness.

Operation — Hobbing a six-key taper spline on end of shaft.

Hob — Barber-Colman Taper Spline Hob. Length, 3⅞"; diameter, 3"; 1¼" taper bore; 16 gashes.

Hobbing Machine — Barber-Colman Type T.

Holding — Centering chuck drives on outside diameter of the gear.

Feed — Longitudinal feed, 0.090" per rev. of work.

Speed — Hob speed, 103 r.p.m.

Taper Spline - Outside diameter, 1.372"; length, 1⅝"; root diameter, 1.141"-1.140"; key width, 0.342" - 0.341"; included angle, 8° 7' 50".

Production Time — 4.18 min. floor-to-floor, each complete taper spline shaft-end. Average production, 8 hours, 93 pieces.

Pieces per grind — Up to 1000. Hob life, 18 grinds or approximately 18,000 work pieces.

Remarks — The operator of this machine simultaneously runs a B-C Type A which hobs the gear on the shaft.

Many plants, the same as this large tractor manufacturer, are reporting substantial economies and accurate high production from Barber-Colman Hobs and Hobbing Machines. Take for example this job where Barber-Colman hobs are averaging up to 1000 pieces per sharpening and during a total life of 18 sharpenings per hob produce approximately 70,814 lineal inches of taper spline. That's equivalent to well over a mile of spline.

Barber-Colman manufactures an extensive line of ground and unground hobs for spur gears, spiral gears, involute spline shafts, taper spline shafts, and special forms of various types. Have a Barber-Colman Hobbing Engineer consult with you on the matter of reducing hob cost, or improving accuracy and finish on your hobbing work. There is no obligation.

Write for Catalog K covering Barber-Colman Hobs, Milling Cutters and Reamers; contains 263 pages—full of information useful to engineers. Please advise us the name of the company where you are employed when requesting this Free Catalog.

BARBER B-C COLMAN PRODUCTS
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

General Offices and Plant 213 Loomis St., Rockford, Illinois, U. S. A.

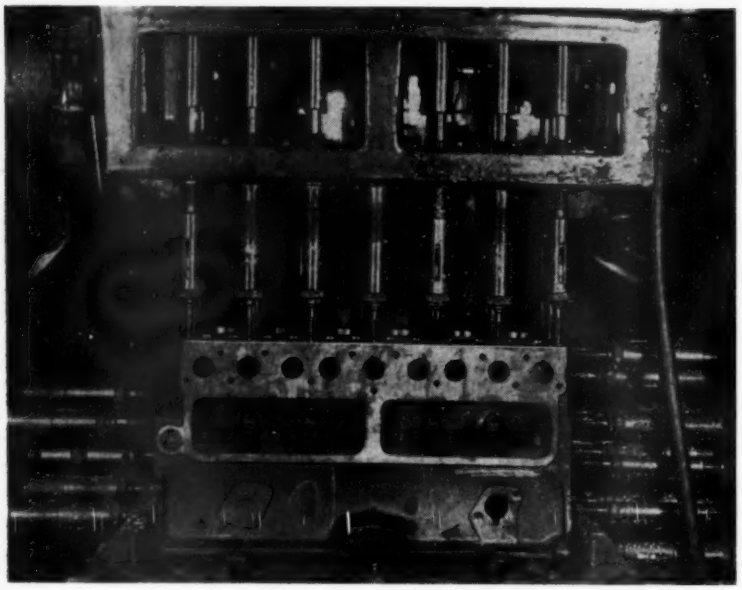
Thread milling alloy steel cylindrical sleeve forgings, using ground thread hobs with special surface hardening treatment. Note thread snap-gage for checking accuracy of work.

speed steel tools, especially taps, are being run at altogether too slow speeds, better results being obtained when the speed is increased to the proper figure. It is not at all unusual in some automotive plants to find ground thread taps running at the same speed as employed for drilling, especially on cast iron jobs.

In this connection we might advise that two of the large automotive companies informed us some time ago that based on a year's production of automobile engines and the total number of taps used during that period, the figures showed that only one tap for each 26 engines was used, or a tap cost of around 3c per engine, which is a tribute to the splendid progress made by tool manufacturers in regard to tap quality.

We also have run across many jobs where reamers are removing altogether too small an amount of metal, resulting in the reamers having short life due to these tools scraping more than cutting. It is very seldom we find reamers removing too much metal, the error usually being in the opposite direction.

Climb milling is coming into more and more use nowadays. Some of the milling machine companies are advertising that their new machines are especially designed for climb milling. One manufacturer of thread milling machines recommends that climb milling be used on practically all jobs performed on their new thread millers. These machines are particularly adapted for climb milling, having a speed range which includes the high speeds suitable for efficient climb milling. This machine is equipped with break or drag on the work spindle, removing all backlash, obtaining better finish and overcoming the natural tendency of the cutter to pull the work ahead which is present to some extent in this method of cutting. The spindle drag is entirely automatic, operating during the cutting only, disconnecting automatically when the rapid traverse is in use, requiring no attention from the operator. Through the employment of climb milling on machine designed for same, a notable increase in production is obtained, together with a better finish and longer cutter life. One of the photographs included in this paper shows the difference in cutting action between conventional thread milling and unconventional or climb milling.



Three-way tapping machine using 43 taps simultaneously. The success of this operation depends to a great extent on uniform tap precision.

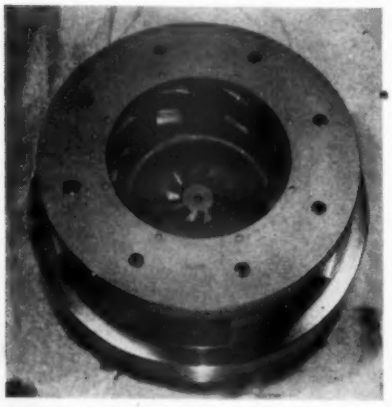
One of the very important factors in connection with the proper use of tools is the kind of cutting oil or cutting fluid employed. On many jobs such as automatic screw machine work, drilling, reaming, tapping and milling, a sulphur base oil is recommended. There are many different types of sulphur base oils on the market, most of these oils giving very satisfactory results. Soluble oils diluted with the correct proportion of water are being commonly employed on many production jobs although in the large majority of cases longer tool life and better finish is obtained with sulphur base oils. Mineral-lard oil which was so commonly used years ago now finds very little use in industry. In the case of machining the light alloys such as aluminum and magnesium, kerosene or kerosene mixed with a small amount of lard oil, or a mixture of half kerosene and paraffin oil are widely used for all types of machine operations on these light alloys with most satisfactory results.

I have personally witnessed many jobs where the tool life and finish have been greatly improved through changing from the cutting oil being used on the job to the proper type oil or cutting fluid.

Care of Tools

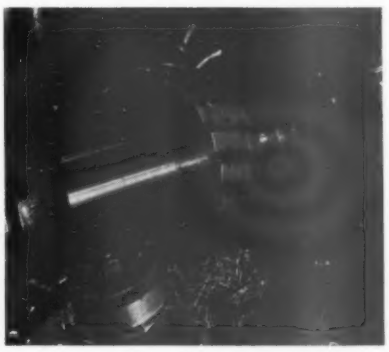
It has often been said that thousands of dollars worth of tools are ruined by many manufacturers yearly due to improper grinding. The manufacturers of precision cutting tools realizing the importance of proper grinding, use every

(Continued on page 54)



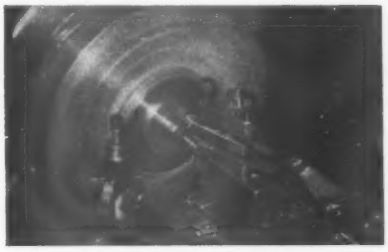
Inserted blade cutter shown at the left is for form milling and facing the butt end of aluminum alloy propeller blades. This 22° diam. cutter has eight formed blades set on a slight spiral, blades having proper rake and clearances for machining this light alloy. Note the ample chip room so necessary for this production job.

On the right is shown form milling heat treated alloy steel parts, using a spiral fluted form cutter. Cutters of this design permit form milling on a production basis due to the shearing action of these form cutters with spiral flutes.



Carboloy Tools Step Up Production of Aluminum Aircraft Parts

Carboloy tools rough and finish face this aluminum aircraft part. Finish facing is done at a speed of 570 f.p.m., with a feed of .002".



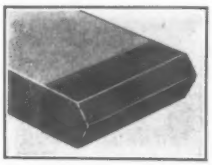
.003" depth of cut. Tool life exceeds the 540 pieces in each lot. This application is but one of many jobs on which Taft-Peirce Manufacturing Company has applied Carboloy cemented carbide as a "general purpose" cutting material. This widespread use of Carboloy has resulted in an over-all production increase of 25% on the jobs where it has been applied.

Carboloy Tool Removes 20 lbs. of 1040 Steel Per Minute

Indicative of the trend towards the use of cemented carbide as a tool material for broad general purpose use in the shop rather than for a few hand picked production applications, is the report recently received from an Oklahoma job shop. This shop reports the use of Carboloy tools on "every conceivable job in the shop." One job specifically mentioned is the turning of heat treated 1040 S.A.E. forgings at 300 f.p.m., .036" feed, with the cut ranging from $\frac{3}{8}$" to $\frac{7}{8}$" deep. 20 lbs. of steel are removed per minute, using a $\frac{7}{16}$" sq. Carboloy tip, $1\frac{1}{2}$" long, with a ground-in chip breaker. Another operation mentioned is the grooving of large cast iron sheaves from the solid at the rate of one groove every $1\frac{1}{4}$ minutes. A lot of 114 grooves were turned without grinding the Carboloy tools.

Speed Up Machinery Reconditioning with Carboloy-Tipped Scrapers

Increased production in many plants is taxing present machinery heavily and as a result of this many manufacturers are reconditioning their old equipment to meet production schedules. Carboloy-tipped scrapers are proving especially helpful in this work as they stand up for long periods of use. Fewer sharpenings means more time spent scraping. One large machine tool builder recently ordered a large quantity of these scrapers as they found that they lasted 2 or 3 hours against 2 to 4 minutes for steel scrapers. Carboloy-tipped scrapers in the hands of an experienced grinder, can be resharpened in a few seconds with a diamond wheel. Complete information can be obtained from Carboloy Company, Detroit.



Recent Carboloy Literature

Manual GT-122, recently issued, gives the latest technique for the rapid, economical grinding of Carboloy tools. It explains in detail the various operations required to free hand grind single point tools, presents grinding machine requirements and offers grinding wheel recommendations. Write for your copy.

Taft-Peirce USES CARBOLOY
TOOLS PROFITABLY
ON JOB-LOTS AS LOW AS ONE PIECE!
AGAIN—the general purpose use of Carboloy tools on small-lot, diversified work
. . . PAYS DIVIDENDS!

In addition to its well-known line of steel and carbide-tipped gages, the Taft-Peirce Manufacturing Company, Woonsocket, R. I., produces a large volume of contract work. This involves the machining of all common metals, such as steel, cast iron, aluminum, bronze, etc., and their alloys, in job lots which range from 1 piece to 1,000 or more pieces per lot, average quantities being between 24 and 75 pieces.

Some months ago, Taft-Peirce set out to determine whether Carboloy tools could be employed profitably on this diversified small-lot work. As a result, the following plan was adopted: (1) A "carbide application man" was appointed within the plant to follow and maintain all carbide tools, (2) A minimum number of carbide tools were designed, each suitable for broad general purpose use on many diversified jobs, (3) General purpose carbide grades of wide application were selected.

Today a relatively short time since its introduction, this general purpose carbide program is producing outstanding results. About 30% of all cast iron jobs and 20% of all steel jobs are machined profitably with Carboloy general purpose tools, and each day adds to this growing use. Significantly, Taft-Peirce can now apply carbides profitably even on 1-piece lots.

We shall be glad to discuss the benefits of a similar program on your own small-lot work.

CARBOLOY COMPANY, INC., 11145 E. 8-Mile St., DETROIT, MICHIGAN

CHICAGO • CLEVELAND • NEWARK • PITTSBURGH • PHILADELPHIA • WORCESTER, MASS.

CARBOLOY

TUNGSTEN CARBIDE—TANTALUM CARBIDE—TITANIUM CARBIDE

FOR CUTTING, SHEARING, SHAPING, EXTRUDING METALS AND NON-METALLICS
FOR REDUCING WEAR ON EQUIPMENT OR PRODUCTS YOU USE OR MAKE

CAUSES OF UNEMPLOYMENT « «

"The key to employment is the production of more wealth."

"There are some 400,000 new young people, each year, joining the ranks of workers and adding to our employment problem."

"In the recovery period 1933-1937, the total of jobs provided in manufacturing industry rose to an average of 8,744,000 in 1937 as compared to 8,838,000 in 1929."

"Business spending, not government spending, is the road to re-employment."

Final Report of A.S.T.E. Fact Finding Committee

JOHN M. YOUNGER

Professor of Industrial Engineering
Ohio State University

Chairman, A.S.T.E. Fact Finding Committee

IN March 1939 and in October 1939 your Fact Finding Committee placed preliminary and intermediate reports before you. These reports dealt almost entirely with the facts relating to machine tools. We have now prepared a final report—at least we think it is final, in which we lay before you some of the facts relating to the causes of unemployment. We say some of the facts because there are many and we have picked out merely what seemed to us most important.

We wish at this time to give credit to Professor O. W. Boston for his research into taxation. To Mr. E. W. Dickett for his work on Government interference. To Mr. Karl Herrmann for his research into money problems and the effect of human selfishness, and finally to Mr. Clayton Hill for his study of the effect of modern efficiency management. The balance of your committee Mr. Ford Lamb, our President Mr. James Weaver and the chairman of the committee Mr. John Younger, met in conference on the review of reports and sought to correlate them.

One fact stood out prominently in the discussion, namely that in 1937 we were employing as many workers as we did in 1929, points to the increase of population and increase by immigration, as having a substantial bearing on the causes of unemployment. There are some 400,000 new young people, each year, joining the ranks of workers and adding to our employment problem.

We did not go into the effect of the influence of women workers, though that factor has had a great effect on the employment of men. Figures or statistics are hard to get and we failed in our attempt to get them.

In the recovery period 1933-1937 the total of jobs provided in manufacturing industry rose to an average of 8,744,000 in 1937 as compared to 8,838,000 in 1929.

In 1929 manufacturing employed 18.4 per cent of the slightly more than 48,000,000 persons who comprised the total employable population. In 1937 however, the percentage dropped to 16 per cent due to the increase in population. In that year employable persons totalled slightly over 53,000,000. These figures do much to explain the vast number of idle persons in the face of an apparent recovery.

Other Causes

In 1929 some of us bought up everything possible on credit, prices were too high, stock, real estate, commodities, etc. We knew the bubble would break and when signs indicated this definitely we thought our employment or investment might suffer so we pessimists didn't buy a car, a shirt, shoes (we had the old ones repaired), no underwear, socks, no furniture or home improvements, etc. and what did we do. Every time we didn't buy we deprived some one of a job. The decorator had nothing to do, we reduced personal service, we sold some things, what little we could sell and made it tough for the optimist.

And industries couldn't continue production because there was no money for production and occasionally when industry tried to produce no place to put the product because pessimists wouldn't buy and the optimists couldn't take the product as a gift. And storage space, after all, in this world is limited in spite of arguments to the contrary.

Does Scientific Management Create Unemployment?

But leaving these thoughts and for a moment we turn to the question, does Scientific Management create unemployment. Such management of course uses the new modern machine tools, but it does much more. It lays emphasis on Time and Motion Study, wage incentive, market control, planning, and the use of modern conveyor systems all of which tends to make a plant more efficient.

Scientific Management is nothing more and nothing less than good management. Techniques and procedures used in scientific management are based upon analytical and technical studies which seek the most efficient means of attaining business objectives. The elimination of all waste is the paramount aim of those who advocate scientific management. Its principles are designed to have material, motion, capital, energy—all waste. The contention that Scientific Management reduces employment would seem to imply that unscientific management increases employment.

By far, the greatest percentage of business failures are traceable to poor management. Business failures may provide work for the legal fraternity, but they can hardly be considered beneficial to the general state of employment. If good management, scientific management, contribute to the maintenance of business activity, not to mention its development and expansion, it can hardly be represented as a threat to employment.

Can this be contributory to unemployment in the long run? Is the record of a scientifically managed company usually one of decreasing employment? To believe this is to believe that lowered costs, increased values and improved qualities lead to diminished consumer acceptance, narrower markets and lessened production.

(Continued on page 44)

MORE STAMPINGS...

Long experience in automotive and other metal stamping plants has proved that Nickel cast irons are dependable, durable and economical die materials. Tough, strong, hard, exceedingly dense in structure and resistant to wear, Nickel cast iron dies give greater production with fewer redressings and interruptions of schedules. Please write for your copy of the helpful new booklet, "Nickel Steels, Nickel Cast Irons and Non-Ferrous Nickel Alloys for Modern Production Equipment."

...FEWER REDRESSINGS

on dies cast in **NICKEL** alloy irons

SHEET STAMPING—Because they are strong and hard, wear resistant yet readily machinable, Nickel-chromium cast iron dies are extensively used in forming sheet metals. Fine-grained Nickel alloyed irons take a high polish, eliminate galling and streaking of stamped parts. Plant experience proves that Nickel iron dies wear 3 to 6 times longer than plain iron dies.

PRESSING AND STRIKING—For pressing novelty coins, identification tags and discs and a wide variety of such products, Nickel-chromium cast iron dies have proved very satisfactory. Nickel cast iron dies are also used for striking and forming malleable iron castings warped during annealing or parts not easily cast in final shape. Nickel irons can be heat treated to develop high mechanical properties.

HOT PROCESSING—Resisting heat and mild shock, Nickel-chromium cast iron dies are used successfully for many drop forging and hot processing applications. In forming light steel parts; light and medium brass, bronze and Nickel silver forgings, Nickel cast iron dies offer a long useful life at low initial cost. Costs of sinking Nickel alloyed iron dies are reduced because blanks can be cast closely to shape thereby minimizing finishing. Your inquiries regarding dies and many other money-saving applications of Nickel cast irons and Nickel alloy steels are invited.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

Production Perspectives

News of Mass Manufacturing from Everywhere

CHRYSLER CORP., with two new engineering and research laboratories, is ready to assume its role in national defense plans and could, if necessary, assemble a light tank as rapidly as it now does an automobile. While Fred M. Zeder, vice chairman of the board, dedicated the new buildings at Detroit June 6, a ranking engineer revealed that Chrysler or any other automotive concern with as many mass production facilities could turn out mechanized units with minimum delay. If an order for armaments were placed with Chrysler, he said, a new plant could be constructed within a few weeks. Simultaneously, tools and dies would be prepared for immediate installation. Machinery could be obtained immediately by "robbing" plants in Chrysler's nationwide chain. Armor plating would offer no problem, he said, inasmuch as shelf steel is easily placed on a chassis. If light tanks were needed, the assembly lines could roll as fast as they are now on 1940 models, but if heavier ones were ordered the assembly obviously would be slower, he said.

All plans have been surveyed and each is ready to play its part when and if large armaments orders are placed, he said. "On the average day," Zeder said, "1500 research tests and projects are in progress here. And each one of them has a stated objective, a detailed budget and a deadline for completion. Among the means of research at our command will be the X-ray tube to study the atomic structure of metals; the spectroscope to ascertain the elements of which an experimental part is composed; polarized light, to study stresses in working parts of our cars and trucks; electro-physical apparatus to produce voltage up to 500,000; cork suspended rooms for absolutely vibrationless weighing; cathode tubes to measure the most complicated or simple vibration; photomicrography to enable us to magnify up to 5000 the original; and the wind tunnel for aerodynamics research."

SEARCH for the type airplane engine that the automobile industry could produce to take up the slack in aircraft production, due to an apparent inability of the engine industry to expand speedily, is being made by Government and industrial technicians. Edsel Ford, president of the Ford Motor Co.; Paul Hoffman, president of Studebaker; Alfred P. Sloan, chairman, and William S. Knudsen, president, of General Motors and officials of Packard and Chrysler Corp. have conferred with Government officials at Washington on the subject. Ford has gone a step further in the assertion he can build 1000 planes a day, if given the time to prepare, under proper conditions. However, no mention has been made as to the type plane he could turn out in that volume. To produce planes in such great quantities would mean assembly line production of both ship and engine. This would mean that military planes so produced would have to be powered by production job engines, instead of hand-built power plants such as used today in American aircraft construction.

While the production engine would not have the endurance of the hand-built engine, it could be built to stand up for 50 or 100 hours in the air and could easily be replaced at the end of that period. "Souped up," the production engine would give efficient performance in the air, even if for a shorter period. They could be turned out at considerably lower costs and in greater volume. Germany has established its superiority in plane production by mass production, with planes good for only 100 hours in the air. The auto industry now turns out about 20,000 automobile engines daily. An increase of only 3 per cent in the number of engines produced by the auto industry would meet the demand for 50,000 planes a year, even with an average of three engines per plane.

The Cleveland Diesel Division, General Motors Corp., is low bidder at $4,399,964 for machinery for six new submarines to be built under the Navy's 1941 fiscal year construction program. The program also includes replacement of engines on the submarines Nautilus, Narwhal and Argonaut, on which the Cleveland firm bid $1,272,050, the only offer submitted for the work.

Completion of a new type experimental single-seat fighting plane for the United States Navy has been announced by the Bell Aircraft Corp., Buffalo, N. Y. In a Navy-approved announcement, the manufacturer described the new craft, designated XFL-1, as an "all-metal, low-wing monoplane powered with an Allison 12-cylinder engine of more than 1000 horsepower." It said the plane was designed for aircraft carrier operation. The plane was given its first trial flight May 14, but further information was refused except that the preliminary trial was "satisfactory."

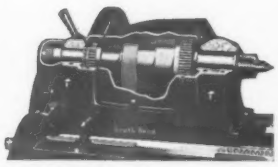
DEMANDS for competent operators of turret lathes—one of the key machines in present industrial production—has resulted in the organization of a Turret Lathe Operators' Service Bureau, the Warner & Swasey Co., Cleveland machine tool builders has announced. Operation of the service bureau was explained by Clifford S. Stilwell, vice president of the company, who told a group of the nation's leading personnel executives in New York City that the bureau will begin operating at once. It will aid in the training of apprentices, help experienced operators, and send lecturers to manufacturing plants throughout the country.

General Motors Corp. entered the airplane propeller business June 1, through acquisition of the assets of the Engineer Projects, Inc., Dayton, O. New division will be known as Aero Products Division of General Motors Corp., with Werner J. Blanchard as general manager and Charles S. J. MacNeil, chief engineer.

RALPH E. FLANDERS, chairman of the industrial committee of the New England Council, declares the area's 15,500 manufacturing plants, representing 200 types of production were ready to supply a great variety of the "hundreds" of items needed under the national defense program." Flanders, president of Jones and Lamson Machine Company, of Springfield, Vt., and a national figure in the machine tool industry, said in a statement that "as rapidly as our manufacturers are informed of the government's requirements they will adequately perform any task assigned them. All we ask," he added, "is that the national production program be placed in the hands of men familiar with the processes of modern industry. Under the leadership of such men New England industrialists can and will work most effectively for the national interests."

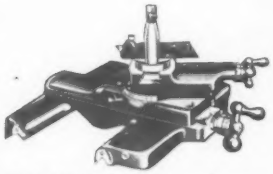
(Continued on page 60)

Precision is Assured IN A SOUTH BEND LATH

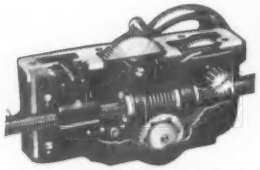


HEADSTOCK. Cutaway view showing integral type bearing and the capillary oiling system.

SUPERFINISHED SPINDLE is made of alloy steel with bearing surfaces carburized, hardened, ground and superfinished.

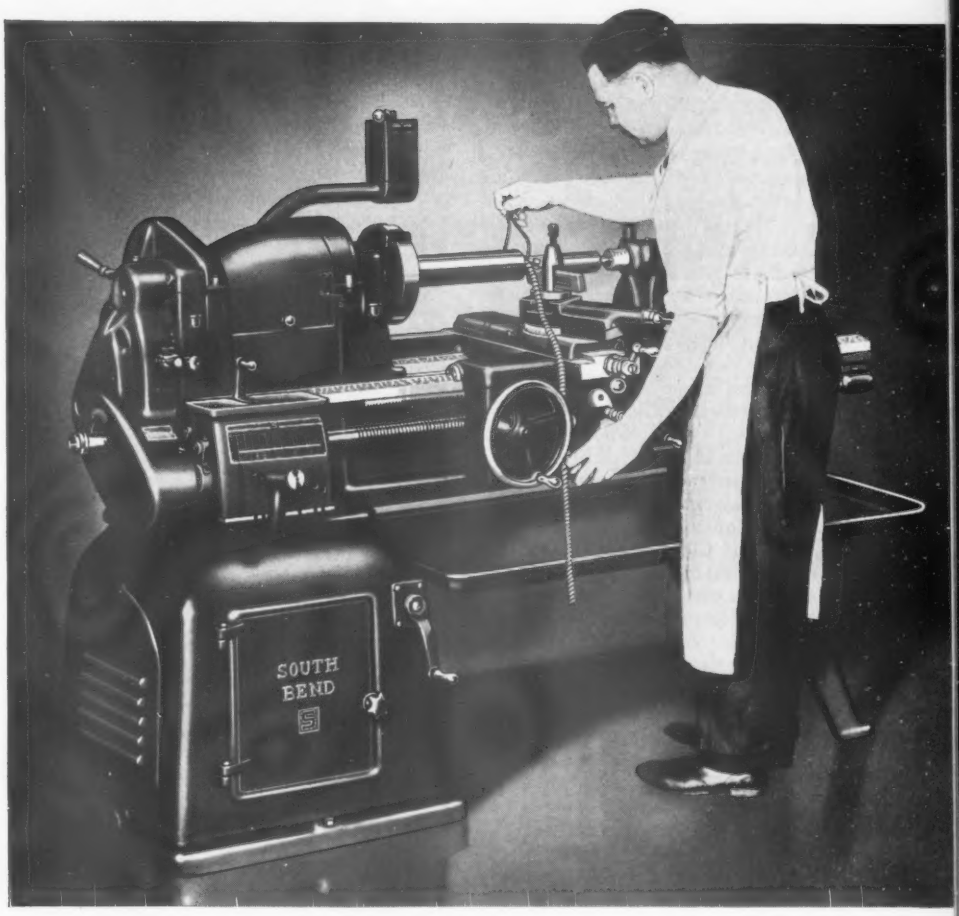


IMPROVED SADDLE and compound rest with adjustable tapered gibs. Cross slide bridge is wide and deep, providing rigid support for the tool rest.



DOUBLE WALL APRON is rigid box type construction with all steel gears running in oil bath.

UNDERNEATH MOTOR DRIVE. Belt drive to spindle is smooth and powerful and provides a wide range of spindle speeds.



PRECISION is assured in South Bend Lathes by combining fine workmanship with sound machine design. Expert mechanics, skilled by years of experience, fit and test each unit with a degree of exactness known only to the machine tool builder.

South Bend Lathes are used in the tool and gauge departments of nationally known manufacturers for the most exacting classes of precision work. They are also used for production operations on interchangeable parts requiring a high degree of accuracy. Conveniently located controls assure an ease of operation which reduces operator fatigue, resulting in a uniformly efficient rate of production over a long period of time.

ON DISPLAY IN ALL PRINCIPAL CITIES

Baltimore, Md.—Carey Machinery & Supply Co.
Boston, Mass.—The MacKenzie Machinery Co.
Bridgeport, Conn.—A. C. Bisgood
Buffalo, New York—R. C. Neal Company, Inc.
Cleveland, Ohio—Reynolds Machinery Co.
Dayton, Ohio—C. H. Gosiger Machinery Co.
Detroit, Mich.—Lee Machinery Company
Houston, Tex.—Wessendorff, Nelms & Company
Los Angeles, Cal.—Eccles & Davies Mach. Co.
Milwaukee, Wis.—W. A. Voell Machinery Co.
Newark, N. J.—J. R. Edwards Machinery Co.
New York, N. Y.—A. C. Colby Machinery Co.
Philadelphia, Pa.—W. B. Rapp, Machinery
Pittsburgh, Pa.—Tranter Manufacturing Co.
Portland, Ore.—Portland Machinery Company
Providence, R. I.—Geo. T. Reynolds & Son
Rochester, New York—Ogden R. Adams
St. Paul, Minn.—Robinson, Cary & Sands Co.
San Francisco, Cal.—Moore Machinery Co.
York, Pa.—York Machinery & Supply Company

SOUTH BEND LATHE WORKS

LATHE BUILDERS SINCE 1906

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TRADE MARK SOUTH BEND

» » A.S.T.E. DOINGS « «

By IRWIN F. HOLLAND

CLEVELAND

CLEVELAND CHAPTER held its last meeting before summer on June 14 at the Allerton Hotel. It seemed as though the setting of the "Gang Busters" radio program had been transposed to the Allerton and one could almost hear the rattle of machine guns as Mr. W. L. Listerman, who is in charge of the Cleveland Office of the Federal Bureau of Investigation, provided the members with a thrilling account of the activities of the "G-MEN" engaged in stamping out crime and the apprehension of lawbreakers. Because of the rigorous physical and educational qualifications, only the highest type of individual is selected and trained for this type of work. Mr. Listerman stressed the great importance of the law-abiding citizens and the local police departments in cooperating with the F.B.I. in order that the Federal authorities might do a more thorough job in preventing and stamping out crime.

Following Mr. Listerman's narrative, the members were shown a sound movie, through the courtesy of the Shell Oil Company, which clearly depicted the various processes oil passes through from the time it is piped from the ground to the time it reaches the ultimate consumer. The pictures graphically illustrated the method of locating oil deposits, the difficulties involved in the drilling of wells and the laying of pipe lines, and the various refining processes it passes through before its shipment to the consuming market.

The culmination of the night's events was provided by J. H. Penske Jr., District Manager of Williams and Company, and through his efforts the members were privileged to hear a discourse on "Nickel Alloy Steels" by Edward J. Hergenroether, Metallurgist in the Research Department of the International Nickel Company. Mr. Hergenroether extolled briefly on the discovery of nickel, the difficulties encountered in separating it from its component parts, the various types of nickel alloy steels and the special uses they are adapted to, its high physical strength and toughness with unusual corrosion resistance and ease of fabrication, and to the various uses of nickel in the industrial and commercial field. To provide the members with a clearer picture, graphs and charts were shown comparing nickel alloy steels in strength, toughness, resistance to corrosion, and length of tool life with ordinary tool steels.

Topping off Mr. Hergenroether's talk, movies illustrating the operation of the International nickel mines in Canada were shown together with pictures of their Canadian and United States factories. The passage of the ore from the mine to the factories to be converted into nickel alloy steels was very interesting, and it certainly was a revelation to see the huge melting furnaces, the vast amount of technological machinery that seemed almost human in its actions, the high skill and expert handling of the molten metal by the heat treating workers, and the modern production facilities of this world-wide organization.

TOLEDO

The Toledo Chapter of the A.S.T.E. presented a "double feature" program at the technical session held at the Toledo Yacht Club on June 11, 1940, and as the sixty-six persons who attended were pleased with the program and with the improvement in the dinner, Chairman Rennell promises more of these meetings in the future.

The short feature of the evening was presented imediately following the dessert course by Carl Ostrosky, member of the Toledo Chapter, who read his paper on "Heat Treatment of Tool Steels." Gus Ehrhardt then introduced Mr. C. R. Staub, Chief Engineer of the Michigan Tool Company, who presented the main feature of the evening in the Ballroom of the Club. Mr. Staub's paper on "Ground Form Finishing Hobs" was illustrated with slides, and the program concluded with a discussion and questions from the floor.

We have a host of talent here in Toledo and plan to present more of these double features to enable our local members to give us the benefit of some of their experiences.

Our new officers have had their heads together and have planned an excellent program for the next year following our summer vacation period, so plan to attend *all* the meetings next year.

ROCHESTER

About forty members of the Rochester Chapter went through the glass plant of Bausch & Lomb on Saturday morning, June 8th accompanied by well-informed guides supplied by our host. Optical glass of both the sheet and cast types was observed in all stages of manufacture, mixing and melting, and the numerous inspection stages were explained and made a profound impression upon those who had the pleasure of seeing them.

A very successful open forum covering shop problems was held June 12th at the university of Rochester, River Campus. Chairman, John Dense, introduced Eastman Kodak's able Tool Engineer, Frank O'Brien, who directed the forum.

Bernie Williams of Taylor Instrument presented an interesting 18-8 punching job which not only required smoothness, extreme accuracy of hole size, but quantity production as well.

William Gordon of Camera Works showed a problem he had in the finishing of small conical shaft bearings having a spherical point of contact. He also discussed another problem of fastening small studs on thin sections of steel sheets.

Cliff Boes, another Eastman Kodak

Photo—Gates, Cincinnati Enquirer

Left to right: W. D. Averill, Scty.; Lou Weber, former chrmn.; Ford Lamb, Nat'l Scty.; Tom Kling, Vice Chrmn.; W. J. Frederick, Chrmn., and Chas. Carr, Treas. Cincinnati Chapter. Plans for the Semi-Annual Meeting, Oct. 17, 18, 19 were being made as the theme of the important meeting had been decided as "Tools and Men for National Defense".

For more Production ...FAST!

Delta Tools are the Answer

Here's why: (1) Immediate delivery; (2) Low First Cost despite their modern advanced design and many exclusive features; (3) Low Operating and Maintenance Costs; (4) Reduced Labor Costs through their use as auxiliary tools to fill in "working time"; (5) Flexibility, permitting their quick adaptation for special set-ups; (6) Portability and Adaptability to quick changes in production set-ups. In these days of quick shifts in production requirements, factories and shops of all sizes and types are installing Delta Drill Presses by the thousands. The 14" and 17" models, single and multi-spindle units are being set up both as auxiliary tools and in large batteries as basic production units. Delta drill press heads and columns are being adapted for special set-ups at great savings. Everywhere—Delta drill presses have fully demonstrated their remarkable ability to "take it" under the toughest conditions and to make performance records equal to machines that cost many times as much.

NO. 1370 FLOOR TYPE 17 IN.

"Sio-Speed" Delta Drill Press with No. 2 Morse Taper Spindle and Standard Tilting Table, without motor or switch

$89.50

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Don't judge the value of Delta drill presses to your shop by their low cost. It will pay you to investigate them carefully and learn the full possibilities of these quality units that are affecting a revolution in present day production methods. Fill out the coupon and send for the complete catalog of Delta low-cost drill presses.

No. 1555—17 Inch Four Spindle "Sio-Speed" Drill Press, No. 2 Morse Taper Spindles. Available in High Speed or with ½ Inch Jacobs Chuck.

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A. S. T. E. Doings

man, presented a couple of screw machine problems.

Jake Philippsen showed the boys an ingenious spring steel forming job. Each and every one of these jobs was ably presented, and the audience showed real interest by suggesting, questioning, and constructively criticizing those who took the floor.

ST. LOUIS

St. Louis Chapter held its regular monthly meeting Thursday, June 13, at the Melbourne Hotel. After dinner, the heads of the various committees were called upon to report in full on the programs they had outlined for the coming year. Following this business session, one of the local Chapter members, Mr. Fred Meyer of the Progressive Service Company, showed a movie on the manufacture of Clicker Dies, which he described in a most interesting manner as the picture progressed. These Clicker Dies are used for cutting leather for shoes, also for paper, rubber, cloth, cork, etc.

This was the last meeting before the summer recess. The next regular meeting will be called September the 12th. The big moment during recess, will be the Picnic on July 13th.

SYRACUSE

The unwelcome heat of a sultry day carried over far into the evening of June 11, when the Syracuse Tool Engineers held their final meeting of the Spring season. Joe Owens was first to shed his coat at the dinner and was soon followed by others present. Later during the business meeting, Joe again came to the fore with his announcement of the yearly Clambake which will take place next September 7th.

Wally Ross, our program committee chairman, announced a tentative program for the next season which included provision for open forum meetings, something which to date has not been attempted by Syracuse.

Mr. C. R. Pardee of the Crucible Steel Company, gave the lecture of the evening on the topic, "The Operation of the Electric Crucible Furnace for Tool Steel Manufacture." A technicolor film was shown depicting the crucible process. Mr. Pardee's lecture and film were well received by those present at the business sessions. With the adjournment of this meeting, Syracuse members and friends began their long fast in preparation for the great day of the Clambake.

WORCESTER

Worcester Chapter held its regular meeting June 10 at Putnam & Thurston's Restaurant. During the dinner which preceded the meeting the members listened to the broadcast of President Roosevelt's speech regarding Italy's entry into the war.

The technical session was called to order at 8:00 p.m. by Carl Lindegren, Vice-Chairman, who introduced the speaker of the evening, Dr. W. R. Fraser. Dr. Fraser is the Metallurgist of the Union Twist Drill Company, Athol, Mass. and is a member of our Chapter. His subject was "The Tool Engineer and the Metallurgist." This was supplemented by slides showing effects of different heat treatments of tool steels. In some respects Dr. Fraser's subject was closely allied with the topic discussed by Vic Erickson at the last meeting. Dr. Fraser's talk was very interesting and instructive and it is with pleasure that the Worcester Chapter recommends him to the rest of the Society.

Hartford, Boston and Springfield were represented respectively by Bob Palmer, John Sylvester and Frank Curtis. An invitation to the Outing to be held June 15 by the Springfield Chapter was given the members of the Worcester Chapter.

The next meeting of the Worcester Chapter will be held in September at a date to be selected later.

BINGHAMTON

The Binghamton Chapter held its June meeting on June 6. The speaker was W. P. Powers of the U. S. Tool Company, of Ampere, N. J., who gave an interesting talk about practical applications for high production on Multi-Slide Punch Presses and Multi-Millers. Mr. Powers was assisted by Mr. A. M. Hanson who projected motion pictures portraying in detail the applications and tool requirements.

ROCKFORD

The June 15 meeting of the Rockford Chapter took the shape of a "Stag" and Golf Tournament. The day was perfect for golf, and seventy members gathered at Morgan Memorial Golf Course with their favorite clubs and accessories for the great play-off. Rudy Haegg appeared with his 18-year-old driver (handle 6 inches extra long) and received quite a laugh. However, the ancient club has been recently reconditioned by Rudy himself, with a goodly quantity of tough floor varnish and unstinted labor. Nevertheless, Rudy whaled away on a 250 yd. drive and it is rumored that the ball nearly dropped in, causing Rudy to spit 3 times instead of the customary once.

Dinner was served inside the club house, and I am told that the chicken nested in noodles and all the fixings went pretty fine following an afternoon of golf.

Rudy Mieli, our secretary was official faucet man (sody squirt) at the 19th hole. Fine work he did, too.

Brinell Gustafson won the honors of the day with a low net of 81. There were many other winners of prizes. In fact, most of the players turned out to be champions one way or another. Burdette Davis was the Chairman of the Committee in Charge of the affair.

SPRINGFIELD

The Springfield Chapter held its first annual clam bake and outing at Turner Park, Saturday, June 15. Over one hundred members and guests were in attendance. Among the guests from the Hartford Chapter were our good friends, Ray Morris, Bob Palmer, and the ever-reliable Henry Moore.

Foursomes in golf got away to an early start at 7:30 A.M. at the Franconia Golf Course. A steady stream of golfers kept the course busy until 10:30.

After partaking of a lunch and the usual refreshments, the members engaged in sporting events which included horse shoe pitching, golf driving, and baseball.

Many thanks and sincere appreciation are extended to the various manufacturers who were donors of the gifts. The committee headed by Ken Abbey worked hard to put this annual bake across. They deserve a lot of credit and thanks from the rest of the Chapter.

PITTSBURGH

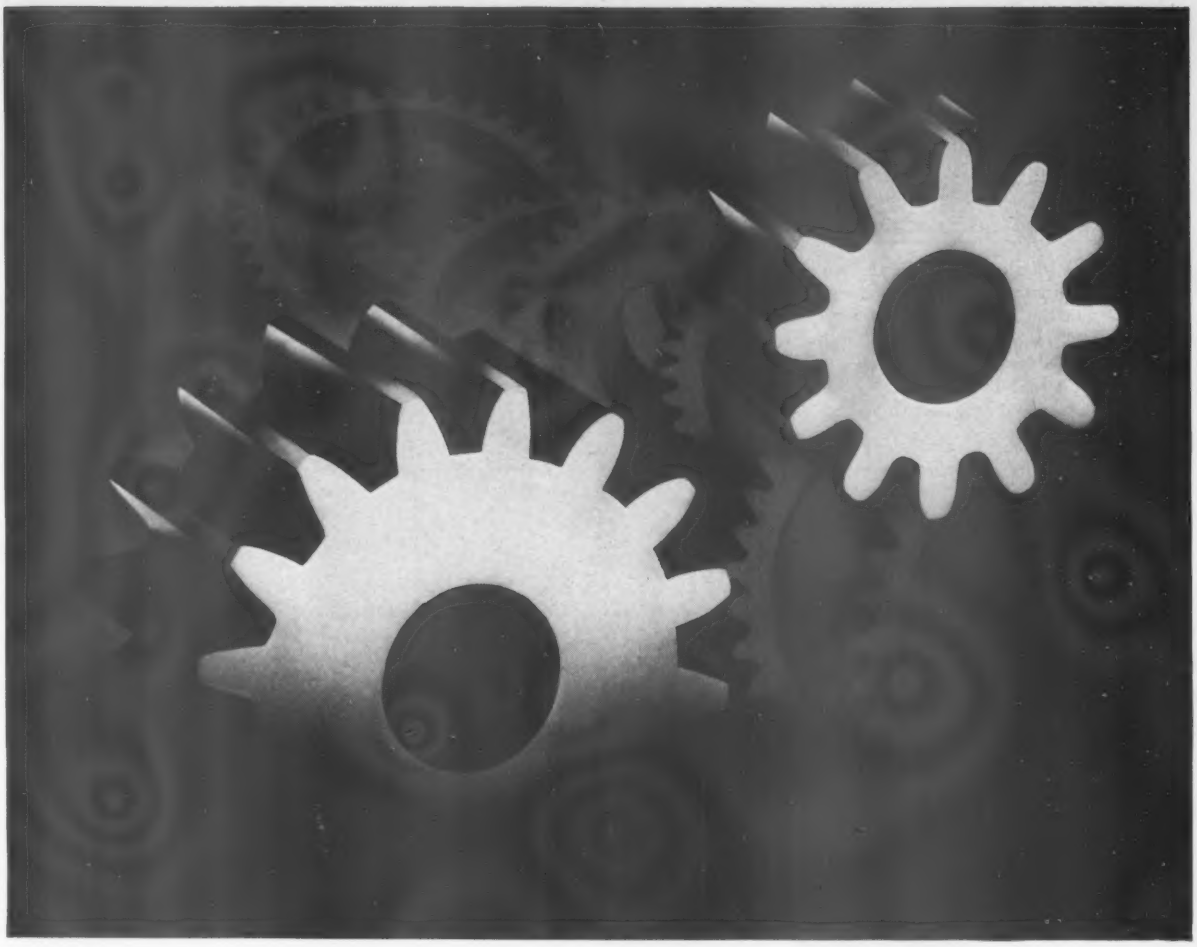
Pittsburgh Chapter closed their present sessions of meetings with the June 14 meeting at the Hotel Henry in Pittsburgh. They will adjourn until the September or Fall series starts again.

Mr. Roberts S. Drummond, Pres. of National Broach & Machine Company and his Broach Engineer, Mr. Al Forberg, were the speakers of the evening and put on a session and discussion that were of most timely interest to all of those attending.

President Wib Peirce of the local Chapter instructed the entertainment committee to prepare for the September meeting a grand-opening get-together, as Pittsburgh is going places. There is to be a special meeting in October before the semi-annual meeting and we are going to get the boys out in numbers and march on Cincinnati.

Owing to our Mr. J. M. Cogan being transferred down East, our Mr. Bill Owen has again agreed to handle the job of Program Committee Chairman. Mr. Cogan just got the job and had to leave us, but Long Island Chapter is getting a good man. Lots of Luck! J. E.

(Continued on page 56)



GETTING THE JUMP ON MAINTENANCE

There are two kinds of deferred maintenance on heavy duty equipment. One is simply that the operator has a way of letting things go until major, and expensive, repairs are unavoidable. The other is due to the inherent ability of the machine to run for long periods without requiring maintenance.

Manufacturers reduce the effects of operating wear and tear by building modern materials into their machines at vital spots. Thus, for example, a builder of heavy duty material handling equipment for mines uses Nickel-Molybdenum (SAE 4640) steel for the all-important drive gears.

The steel can be oil quenched and drawn to produce a hardness from 400-450 BHN combined with excellent strength and toughness. Thanks to the combination, the gears operate for years under all sorts of adverse conditions.

Practical data on 4640 and other Molybdenum steels are given in our book, "Molybdenum in Steel," a copy of which will be sent to you free on request.

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Climax Molybdenum Company
500 Fifth Avenue, New York City

MOLY

Handy Andy Says—

I'M writing a bit ahead of schedule this time, a/c wanting to set a good example for the various scribes who are supposed to give Irwin Holland plenty of co-op in making his job a pleasure instead of a round of headaches. So, if some of my comments seem belated (when you read them) be it known that this May 29, A.D. 1940 and things are happening so fast that, figuratively speaking, tomorrow is obsolete before today is history. Like the train that went so fast that the farmer who bent over to kiss his wife so-long kissed a cow in the next township instead.

* * * *

A reader says that he has been one of my admirers up to now, but reneges a/c something I wrote about XXXXX*, and he says will I please not mention XXXXX** again, but if I must mention them, will I call them XXXXX*** instead. Okay, but I wish readers hither and yon would acquaint me with the pet peeves and phobes**** so I won't have to share the doghouse with Susie. Which now turns the subject to anxious (dog) lovers, over and undersigned gratefully acknowledging advice from divers experts. Now, housebreaking her (Susie, that is) by example is oke as far as it goes, and I admit that a tree comes in right handy at times, only, it doesn't register with Sue who keeps all feet on the ground, being that gender. But thanks for the advice.

Speaking of pooches, Ford Lamb mailed me a card a while back, signed by Connie Hersam, which ostensibly makes me an honorary (?) member of the "Scotties". Accepted in the spirit tendered, but I'm already a member of the Hounds and I just can't be joining every doggone thing. Besides, I thought the Scotties started out as a bottle club. How come, Connie?—trying to muscle in on the Hounds? Zounds!

* * * *

I've finally got a lawn (of sorts) greening and shrubbery sprouting, all of which augurs mild exercise for the summer. Come fall, I'll have time for hobbies, having sorted my raw material (junk, to the Mrs.) and rigged a work bench. (Did you ever consider the mental stimulus engendered of working with tools?) What I really want is a lathe, like this little South Bend that is the answer to a he-man's prayer for a real hobby tool. I'm speaking of the li'l feller now; South Bend makes 'em in all sizes and they really go to town. Another concern that combines business and pleasure is Delta Mfg. Co., whose range of product fits into hobby shop and industrial plant alike. They're real tools, wherever used.

* * * *

Jack Thompson of Danly Machine Specialties drops in often enough so we don't forget his line. Jack, you know, is an A.S.T.E. ophile and one of his hobbies is eating, especially Smorgasbord — which I find fills the tummy long ere the eye is sated. Anyway, Danly specialties have been an important factor in standardizing die design, have saved industry an untold expense.

The Giern & Anholtt Tool Co. come to mind seeing a mention of them in last issue — reminded me both Props. are A.S.T.E. boosters—it's a case of "East, West, Hame's best". Both are devotees of the arts, especially music, get the most out of it by splitting attendance when two concerts are scheduled the same evening. Jimmy Giern (he's the extrovert of the team, I believe) once suggested that I write for the national magazines. But that was when the TOOL ENGINEER was

(Continued on page 40)

*Censored.
**Ditto.
***Ditto.
****Topic for academic debate. I say "phobes"; Roy Bramson would have it phobias. Now, is Hitler an Anglo-phobe or an Anglophobias, and is Win Churchhill a Naziphilias?
Andy loses by a shade. Roy wins

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AND YET FASTER!

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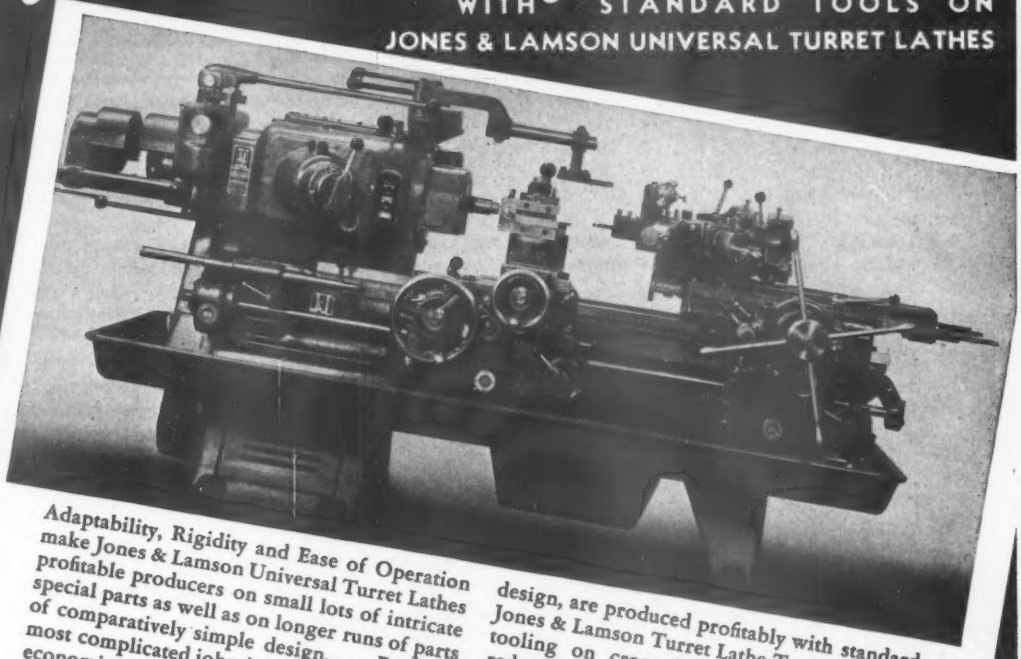
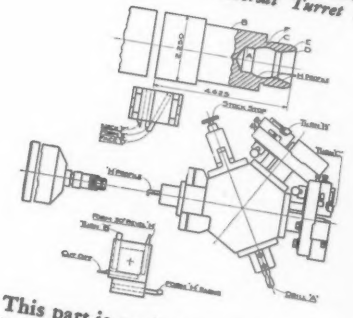
Profitable Performance

WITH STANDARD TOOLS ON
JONES & LAMSON UNIVERSAL TURRET LATHES



Adaptability, Rigidity and Ease of Operation make Jones & Lamson Universal Turret Lathes profitable producers on small lots of intricate special parts as well as on longer runs of parts of comparatively simple design. . . . Even the most complicated jobs, impossible to machine economically on lathes of less advanced design, are produced profitably with standard Jones & Lamson Turret Lathe Tools. Multiple tooling on cross-slide and hexagon turret reduces number of operations and cutting time and with all controls within easy reach of the operator, handling time and operator fatigue are minimized.

New catalogs describing the complete line of Jones & Lamson Universal Turret Lathes will be mailed upon request.



This part is made from chrome molybdenum steel bar stock on a No. 5 Jones & Lamson Ram Type Universal Turret Lathe. All tools and tool holders are standard Jones & Lamson Turret Lathe Tools. A taper turning and boring attachment on the hexagon turret finish bores the taper, straight and radial interior diameters, guided by a former attached to a bar mounted on the headstock. This bar can be swung out of the way when not in use.

J&L

JONES & LAMSON MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

MANUFACTURERS OF: SADDLE & RAM TYPE UNIVERSAL TURRET LATHES . . . FAY AUTOMATIC LATHES . . . AUTOMATIC DOUBLE-END MILLING & CENTERING MACHINES . . . AUTOMATIC THREAD GRINDING MACHINES . . . COMPARATORS . . . TANGENT AND RADIAL, STATIONARY AND REVOLVING DIES AND CHASERS

PROFIT PRODUCING MACHINE TOOLS

HANDY ANDY SAYS—

(Continued from page 38)

in its adolescence, and it's grown into an (inter)national magazine since then. But thanks for the compliment, Jimmy! —I'll start collecting rejection slips one of these days.

* * * *

You know, it's rather nice to be able to pass a bit of cheer and friendliness along, and in the main, I imagine that my comments are taken in the spirit written. But, I would also leave solid substance, especially at a time when civilizations crumble into ashes and ruin; when we know not what the morrow may bring for us. We see nations fall, not so much by enemy assault as from the boring of termites from within—the invisible but deadly "fifth column". Now, I am not a "witch hunter", nor do I fear things which I understand, nor hate because of understanding, and I can understand the foreign agent who is paid by his government to undermine a potential adversary. He is a snake in the grass, but at least he is loyal to his own.

But the so-and-so that I utterly detest is the native born, on the one hand, who would sell his American heritage for a mess of foreign pottage, and the foreign born, on the other, who came to this land to better his lot, then, when his loyalty is taken for granted, turns traitor. Fortunately, the average American—naturalized as native—is wholly loyal; the danger is that an unorganized majority is too often at the mercy of an organized and purposeful minority. Trust your neighbor but cut the cards and keep cool. The subvertionists work best in an atmosphere of mass hysteria.

* * * *

In this connection, we can safely judge the majority of foreign born Americans "by choice", by Wm. Knudsen, erstwhile Dane who is now called to direct mass production in our Defense Program. While he has scaled the ladder of success to dizzy heights because of the opportunities afforded by the *American System*, his kind is, after all, legion. They're "there" when needed. Seventy five years ago John Ericsson (also foreign born) decided an issue in favor of the Union and his Monitor evolved into the modern, turreted fortress of the seas. As, for that matter, his screw propeller launched a maritime empire and, indirectly, contributed to the success of the airplane. One Knudsen, one Ericsson, one Steinmetz, one Pulitzer, one Angelo Patri is each worth a million Pelleys, Browders and Fritz Kuhns, for the one class stands for construction and endurance, the other would build on the shifting sands of wishful thinking. America, grew along in the matrix of freedom designed by the founders!

* * * *

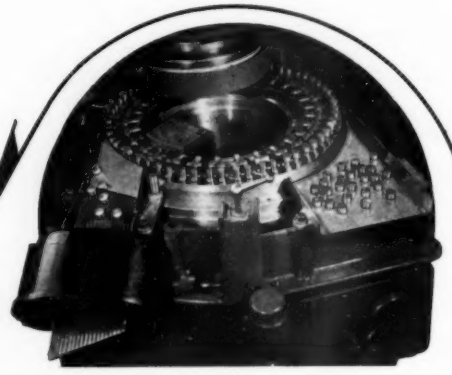
An open letter to his Excellency the President, White House, Washington, D. C.

Dear Mr. President:

I see by the papers that you have sprung a new word on us—"Discombobolating"—thus adding to the turmoil of the moment by starting a lexicographers' war. Now, I thought I was right smart in springing that word on our readers in T/E May issue, but all it got me was a lot of ribbing a/c using a six cylinder word. But you, Sir, have endowed the word with dignity and force; from now on, it's in "high society". I like, especially, the connection of its use; you propose to put through the Defense Program without "discombobolating industry". Splendid! You know, Mr. President, a lot of us have been worried lest, when the Program is over, and the U.S.A. is in a position to make some of these ambitious "gimmies" across the pond say Uncle, there wouldn't be much of anything but war babies to defend.

Personally, I'm for Business and Industry, big and little, a/c providing a living for some millions of us and maintaining the prosperity of the Nation as a whole, besides being a right healthy source of revenue for the New Deal, which is worth a thought. Now, far be

(Continued on page 58



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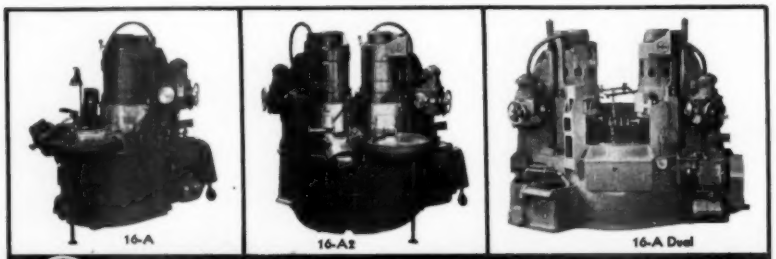
The Blanchard line of Automatic Surface Grinders has established an enviable reputation for earning profits on flat surface work produced in quantity. The No. 16-A is equipped with one wheel, and performs the following operations automatically — chucking, grinding, sizing, measuring, unloading, demagnetizing, and cleaning the chuck face. The No. 16-A2 retains all the automatic features of the 16-A, but is furnished with two wheel heads — one for roughing and one for finishing. This allows the use of a different grade wheel on each head which results in greater accuracy and production, and finer finish. The No. 16-A Dual is actually two 16-A machines in one. Work is loaded and unloaded by two operators, one on each side of the machine. This saves floor space and fixture cost. Send Blanchard full information on your flat surface work — full information on how to cut your costs will be sent gratis.



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Answering 5 Common Questions on "TOOL-CAUSED SHUTDOWNS"

In The Average Plant, How Many Hours and How Much Output Can Be Gained By Reducing Tool-Caused Shutdowns?

These tools show typical gains—ranging from several hours to a week or more in a 200 working hour month . . . from a few thousand pieces extra output to nearly half a million per month. These figures are *not* the total tool life, but represent the *extra* hours for production and *extra* output per machine *gained* each month by improving tool performance.

How Can I Spot Tools Causing Unnecessary Shutdowns In My Plant?

You can do it by judging tool performance on the basis of the Good Tool Formula—described and illustrated in Carpenter's new book on hidden plant capacity (see coupon below). Experience shows that the biggest trouble makers are often tools that seem to be O.K. but which can be vastly improved by the use of tool steels better suited to the job.

Once Sub-Performance Tools Have Been Spotted, Is It Easy To Reduce Tool-Caused Shutdowns?

Yes—provided you have tool making experience, and provided you use Carpenter's Matched Set Method of Tool Steel Selection. By combining the two, you can put your finger on the trouble at once. Then you simply follow the arrows on the Matched Set Map to find the remedy.

How Much Does It Cost To Introduce The Matched Set Method Into A Plant?

Not a penny and no trouble. In fact, by making the selection of the most economical tool steel easy, you actually can *reduce* the cost of your tool steels as well as reducing shutdown time. Each step is taken in accordance with detailed instructions given in black and white.

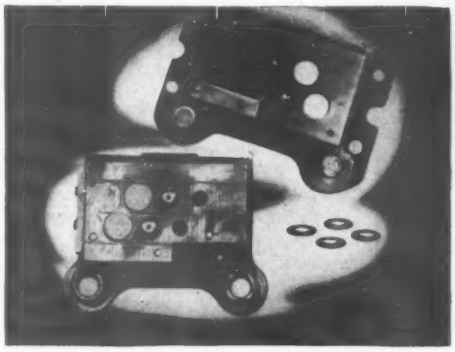
What Is The First Step I Should Take To Reduce Tool-Caused Shutdowns?

The first step is to mail the coupon for a free copy of "Spotlighting A New Hidden Way To Get More From Your Present Production Set-Up". This new Carpenter book tells how to put your finger on the "Shutdown Problem", and suggests the easy, quick way to do something about it.

THE CARPENTER STEEL CO.
READING, PA.

HORN DIE
4 More Hours For Production Per Month 10,220 More Pieces Per Month

PIERCING DIE
33 More Hours For Production Per Month 39,400 More Pieces Per Month



BLANKING DIE
64 More Hours for Production Per Month 460,000 More Pieces Per Month

Carpenter MATCHED TOOL STEELS

THE CARPENTER STEEL COMPANY
122 Bern Street, Reading, Pa.

Gentlemen:

Without obligation, please send me my copy of your new book on the "Shutdown Problem" and how it affects output and unit costs in my plant.

NAME..... TITLE.....

FIRM.....
(Firm Name Must Be Given)

ADDRESS.....

CITY..... STATE.....

HIGH SPEED STEELS

(Continued from page 15)

by symbols for analysis? This avoids the necessity of purchasing small quantities of a steel specified as to manufacturer when large amounts of identical steel, except from a different source, are in stock. Quantity extras are a big item in High Speed Steel purchasing, and may be radically reduced by an appreciation of the fact that many of our best advertised trade names are pasted on identical analyses.

In questions of specification where there is no similar experience within your own records, it is a good policy to consult a steel manufacturer of a reputable cutting tool source for a recommendation. There is a breadth of experience available from these sources that is not usually found within your own organization. This is particularly true in the machining of comparatively new materials such as plastics, stainless steels, and some recent non-ferrous alloys.

I would like to make some broad suggestions for High Speed Steel specification that may be helpful. In deciding which analysis to use, we must first consider the part to be machined, and be sure that we specify a material capable of standing up under the necessary speed and feed. If the tool involved is of very simple construction, the cost of the High Speed Steel involved is a large percentage of the total tool cost. In this case, it is economical to specify the cheapest steel that seems to have the necessary capabilities. If the tool is complex and calls for considerable labor in its manufacture, the steel cost will be a lower percentage of the total cost of the tool, and it is a good policy to play safe by using a higher priced High Speed Steel, if the use of that steel may more reasonably assure satisfactory performance.

Cost Factors

The factors that influence ultimate tool costs are difficult to set down in black and white. They are unique within any one organization, and are usually best understood by the Tool Engineers within that organization. For that reason, the designation of the material to be used on a tool should be made by the Tool Engineer who is responsible for the performance of that tool. Overall performance should be the sole consideration when specifying analyses of High Speed Steel. Many an otherwise aggressive concern is refusing to avail itself of the performance economies of the recently developed analyses on the grounds that the scrap value of mixed High Speed Steels is lower than that of scrap of only one analysis. The scrap value of High Speed Steel must be considered by all large users of tools, but it is "penny wise and pound foolish" to emphasize a difference of a few cents a pound in scrap value and overlook the lowered unit tool costs possible with well chosen but variegated types of material.

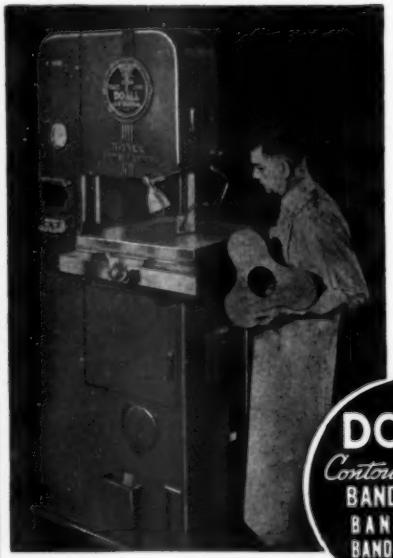
The question often arises as to whether we should specify a Tungsten or a Molybdenum analysis. Some users are bound to the Tungsten steels because they do not have the equipment or the experience to anneal and reharden the Molybdenum steels if that method of salvaging becomes necessary. It seems reasonable that within a short time, everyone heat treating High Speed Steels will have modern equipment capable of safely handling any analysis. Others shy from Molybdenum on the grounds of lower scrap value, but we have just pointed out how economically unsound this reasoning may become. Laboratory tests and experiences on actual production have repeatedly shown that a Molybdenum steel will outperform a comparable grade of Tungsten. This holds true in spite of the fact that the Molybdenum carbides are softer than the Tungsten carbides. The answer to this phenomenon appears to be in the different heat conductivity of the two. Molybdenum steels are better conductors of heat than the Tungstens, and hence prevent the cutting portions of the tool from overheating with consequent failure. The stock price of the two types

(Continued on page 52)

DoALL MAKES DIES FOR CERAMICS IN 1/10 FORMER TIME

Photograph shows ceramic parts, some as small as 1/16" sent us by Sutpakoff Laboratories of Pittsburgh. They write: "We are pleased to mail you ceramic samples. Note these are miniature parts. Dies are made of Mangana Steel and our DoAll 'walks right through' the most complex design in from 1/4 to 1/10 the usual time. The DoAll is one of our most versatile and time saving machines."

Fastest Method to Cut All Metals



The DoAll is a moderately priced, rugged precision machine tool that replaces shaping, milling and lathe work with enormous savings of time, labor and material. Cuts out internal and external shapes from any metal up to 10" thick.

Used in large and small plants in 30 countries by manufacturers of all kinds of metal goods, machine parts, dies and tools, appliances, equipment, motor cars, airplanes; also by ship builders, railroads, arsenals, etc.

DO-ALL Contour Machine
BAND SAWING
BAND FILING
BAND POLISHING

Let a factory trained man bring a DoAll to your plant and show you what it does, what it saves on your own work.

FREE—New Handbook on Contour Machining—158 pages of valuable metal working helps.

CONTINENTAL MACHINES, INC.
1304 S. Washington Ave.,
Minneapolis, Minn.

☐ Send data on the DoAll. TE-7
☐ Send Free Handbook.

Name.....

Address.....

USE "LOGAN" EQUIPMENT

AIR - HYDRAULIC

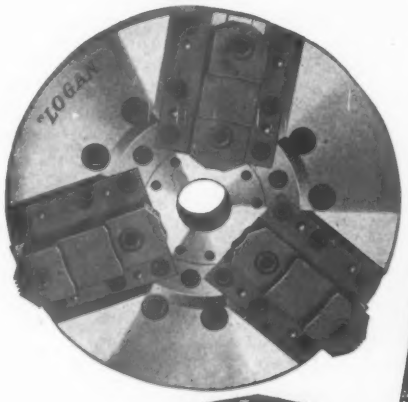
FOR

HEAVY DUTY SERVICE

"LOGAN" AIR and HYDRAULIC Equipment (Valves, Cylinders, Chucks, Presses) are built with extra factors of strength, precision and durability to insure top-flight performance in heavy duty service.

The two new "LOGAN" Mill Type Air Cylinders shown here are part of a complete line designed for steel mills, foundries and similar industries requiring extremely heavy duty equipment. All-steel construction, with mounting flanges electrically welded, these "Logan" Cylinders are built to stand the gaff and deliver superior service.

If you have an operation calling for the utmost ruggedness and dependability, let us prove that it is wise to specify "Logan" Equipment.



LOGANSPORT MACHINE, INCORPORATED
LOGANSPORT, INDIANA

CAUSES OF UNEMPLOYMENT

(Continued from page 30)

Those who argue that scientific management has contributed to the unemployment problem are frequently guilty of making a general assumption from particular instances. Because motion economy resulted in laying off a man or two in a particular instance, they condemn its further application. Because the use of wage incentives raised productivity and temporarily reduced the need for a few workers in a given case, should wage incentive be outlawed and poor effort or laziness condemned? Because operation analysis and methods of improvement met a particular increased schedule without added operators, should these tools or scientific management be discarded generally and technology allowed to stagnate? To magnify particular employment losses thus is to blind ones self to the general increases in employment provided by the expansion of such industries as the automobile, household appliance and aircraft, to mention only a few. In each of these industries, scientific management will be found at work in these companies which grow and endure.

Yes scientific management is *good* management. Over the long course it will do more to raise the living standard and increase the security of our workers than slip-shod, wasteful and unprogressive management which temporarily employs more men. Study of business failures will substantiate the statement that poor management, not scientific management causes unemployment in the final analysis.

We thus failed in our attempt to regard scientific management as a cause of unemployment and so we turned to a different field. We turned to the effect of our modern governmental laws on business and employment.

Effect of Government on Employment

In the study of this subject we find two distinct conditions as a result of having surveyed both large and small business. From small business we learn that Government Regulations and Interference has scared many from starting a private business, has caused many to refrain from expanding their business and has caused many to cease and liquidate the small business they had. As we realize that about 10% increase in total employment in the country would absorb our unemployed it becomes clear that small business may be the large factor in our unemployment problem.

The key to employment is the production of new wealth. Employment in service is controlled by the value of new wealth created to pay for the services. Any additional burden or interference applied to the production of new wealth must affect the total of all employment. Since the production of new wealth consists of the combined use of capital, management and labor in the process of creating something that did not exist before and since the motivating force of the process is rewards or wages for labor and profit for capital it is obvious that the value of the new wealth created must include the necessary rewards and the value of new wealth so created must be within the acquiring ability of the people who need or would like to use it. Additional burdens added to the process, all of which must be passed on to the use of the new wealth created, must restrict the use and thus reduce the volume created and coincidentally reduces employment. Conversely any reductions which can be effected in the production of new wealth increases the use, likewise the volume created and as a natural event increases employment.

We find that the very small business man is definitely afraid to risk his savings in expansion. Further, many individuals would start up a small business of their own employing a few persons if present conditions which scare them out were eliminated.

What are these conditions? We will enumerate them as we found them. For eight years our Federal Government has operated beyond its income. During the

(Continued on page 46)

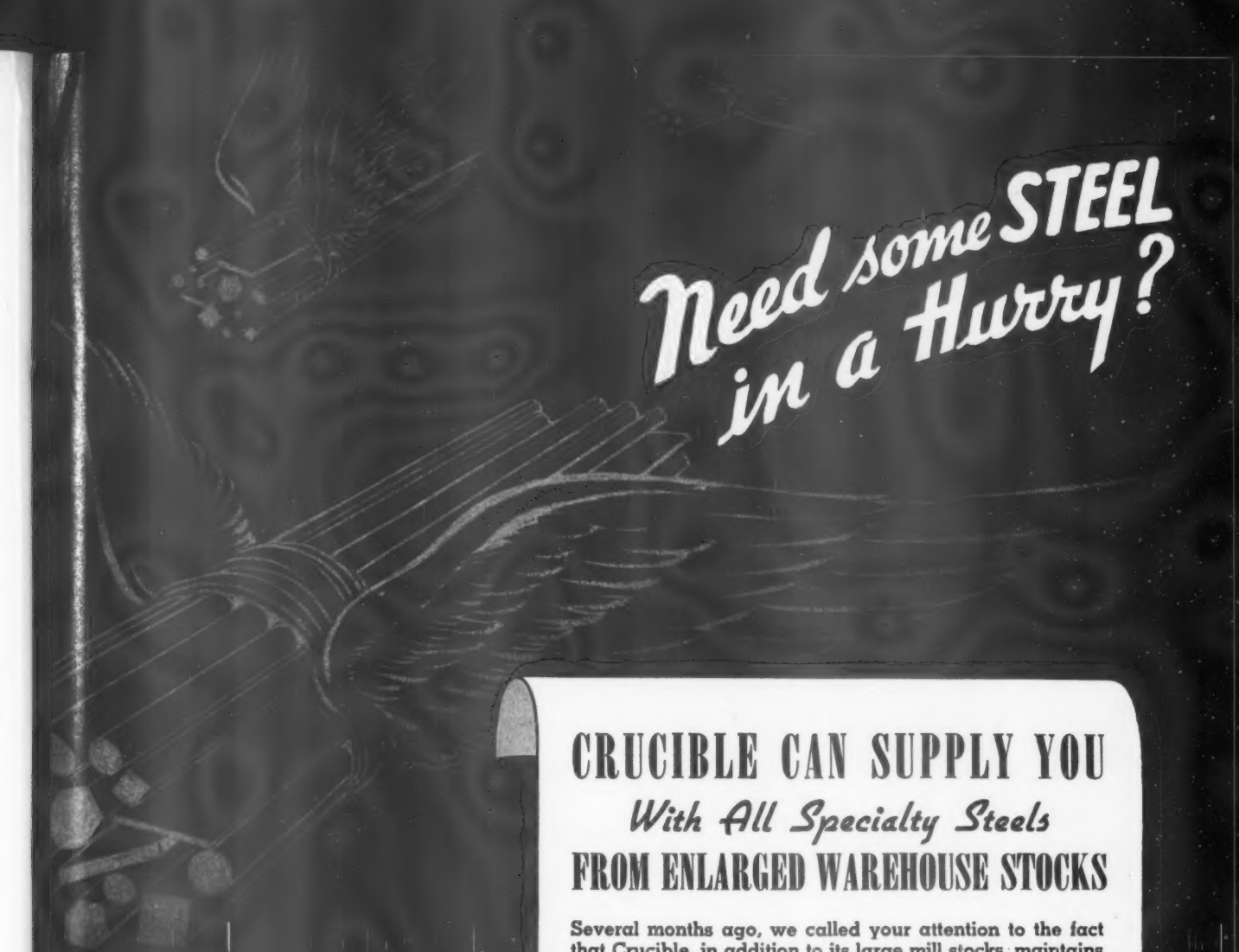
Sundstrand Rigidmil
Holds Plunge Cut To ±0.001"

Close-stop and dwell equipment of Rigidmil illustrated holds depth of keyseats in small crankshafts to ±0.001". Powerful, smooth hydraulic feeds, and high spindle-speeds, mill keyseats quickly, work cutters to capacity safely. Rapid traverse of 325" a minute cuts the time between cuts to a minimum. Operator changes work-pieces at one fixture while milling progresses at another. This installation increases production 200% compared to old method, makes even greater proportionate improvement in operating cost. Enormous range of spindle speeds, and infinite adjustibility of Sundstrand hydraulic feeds in Rigidmils make these millers similarly productive and economical on all work within their capacities. Look into this! See what Sundstrand Engineered Production can save on your milling.

High accuracy and production are provided by standard Rigidmils on a wide variety of other operations. Bulletins shown above have complete illustrated data on No. 0 and No. 1 Rigidmils. Write for your copies today. Ask for Bulletins 382 and 383.

SUNDSTRAND MACHINE TOOL CO.
2532 Eleventh Street, Rockford, Illinois, U. S. A.

RIGIDMILS-STUB LATHES
Tool Grinders - Drilling & Centering Machines
Hydraulic Operating Equipment - Special Machinery



Need some STEEL in a Hurry?

CRUCIBLE CAN SUPPLY YOU

With All Specialty Steels

FROM ENLARGED WAREHOUSE STOCKS

Several months ago, we called your attention to the fact that Crucible, in addition to its large mill stocks, maintains ample warehouse stocks in all key industrial centers . . . so YOU CAN GET THE STEEL YOU NEED . . . WHEN YOU NEED IT . . . under normal as well as abnormal conditions.

In times like these, such assurance of a dependable source of supply is of great importance, particularly when your requirements are for more than one grade or type of Specialty Steel. Crucible alone carries a "Full-Range" of leading Specialty Steels in coast-to-coast warehouse stocks . . . ALL TYPES . . . IN AMPLE QUANTITIES.

Crucible's 26 Branches and Warehouses and its many experienced distributors are ready to make your job easier . . . your production faster . . . with enlarged stocks of HIGH SPEED, TOOL, STAINLESS, ALLOY, PRODUCTION and SPECIAL PURPOSE STEELS . . . whether you need pieces, pounds or tons.

So, when you need "steel in a hurry", CALL ON CRUCIBLE.

Write TODAY for free copy of Crucible Stockbook!

UCIBLE'S 26 BRANCHES AND WAREHOUSES

anta, Ga.	Harrison, N. J.	Providence, R. I.
timore, Md.	Indianapolis, Ind.	Rockford, Ill.
ton, Mass.	Los Angeles, Calif.	St. Louis, Mo.
falo, N. Y.	Milwaukee, Wis.	St. Paul, Minn.
cago, Ill.	New Haven, Conn.	San Francisco, Calif.
cinnati, Ohio	New York, N. Y.	Seattle, Wash.
veland, Ohio	Philadelphia, Pa.	Springfield, Mass.
ver, Colo.	Pittsburgh, Pa.	Syracuse, N. Y.
roit, Mich.		Toronto, Ont., Canada

CRUCIBLE STEEL COMPANY of America

CHRYSLER BUILDING • 405 LEXINGTON AVENUE • NEW YORK CITY
BRANCHES, WAREHOUSES AND DISTRIBUTORS IN PRINCIPAL CITIES

Specialty Steelsmiths to INDUSTRY

CONSULT TELEPHONE DIRECTORY OR THOMAS' REGISTER FOR NEAREST OFFICE

MAKERS OF HIGH SPEED, TOOL, STAINLESS, ALLOY, PRODUCTION AND SPECIAL PURPOSE STEELS

CAUSES OF UNEMPLOYMENT

(Continued from page 44)

years 1933-1940 the Federal Government deficit equals $23,839,000,000.00 making the total indebtedness close to $45,000,000,000.00 the maximum permitted under the law-Government promised that by spending excessively we could bring back prosperity but after the spending was done we find it not only did not bring back prosperity but we find ourselves in a position from which it is increasingly difficult for us to have prosperity. Mr. Average man knows that the debt must be paid and that Government will take it from those who have it and from where it can be found. If he has a very small business he can quietly close it up when the going gets too tough or if he hasn't started he can possibly retain most of what he has in some form of intangible wealth not public enough to be readily found by the tax collector.

Typical of the replies from small establishments is this, "We have to obtain seven different licenses, make so many reports and pay so many different fees and taxes that we have to work long hours just to get by. Sure we could use another helper but the business won't carry the additional burden. Too many hours I have put in on government work for which we receive no return." Mind you in such instances the addition of one waiter, dishwasher or other kind of help would increase employment 15% to 25%.

The unemployment tax definitely prevents the growth of many small businesses. A large percentage of small shop owners will privately admit that they could develop their business to larger proportions and hire more help if it wasn't for the unemployment tax of 3%. They now have less than eight employees and must hold it down because to exceed eight employees and become subject to the tax would wipe out their profit.

Wagner Act—No Remedy

No evidence can be found to show that the Wagner Labor Relations Act has created employment. Only rarely has the application of it increased the yearly income of employees. However, there is plenty of evidence to show that application of the act has increased production costs which resulted in decreased volume because of too high prices and reduced employment. However the fact that the act needs revision seems evident to any unbiased person and the subject is too long to develop in this report.

The above are only a few of the high spots in the study of the effect of Government Regulation. Many of you could doubtless give further facts which tend to show the distressing effect of too much government interference and regulation. However a study of the situation brought us to the question of taxation. We all know that taxation has increased but its effect on employment has hardly been studied. Taxes add to our cost of living and subtract from our purchasing power. We thus have lessened demand of commodities and so lessened employment. Let us look into the situation.

Since the year 1915 federal expenditures have been increased to a much greater extent than those of the state and local subdivisions. In 1915 the two billion dollars of state expenditures were 57 per cent, or more than one-half, of the total governmental costs. Federal expenditures were only 29 per cent of the total. In 1935 the Federal Government's expenditures had increased to 46 per cent of the total, or more than seven billion dollars, while the local subdivision's part was only 40 per cent of the total, as estimated by the National Association of Manufacturers.

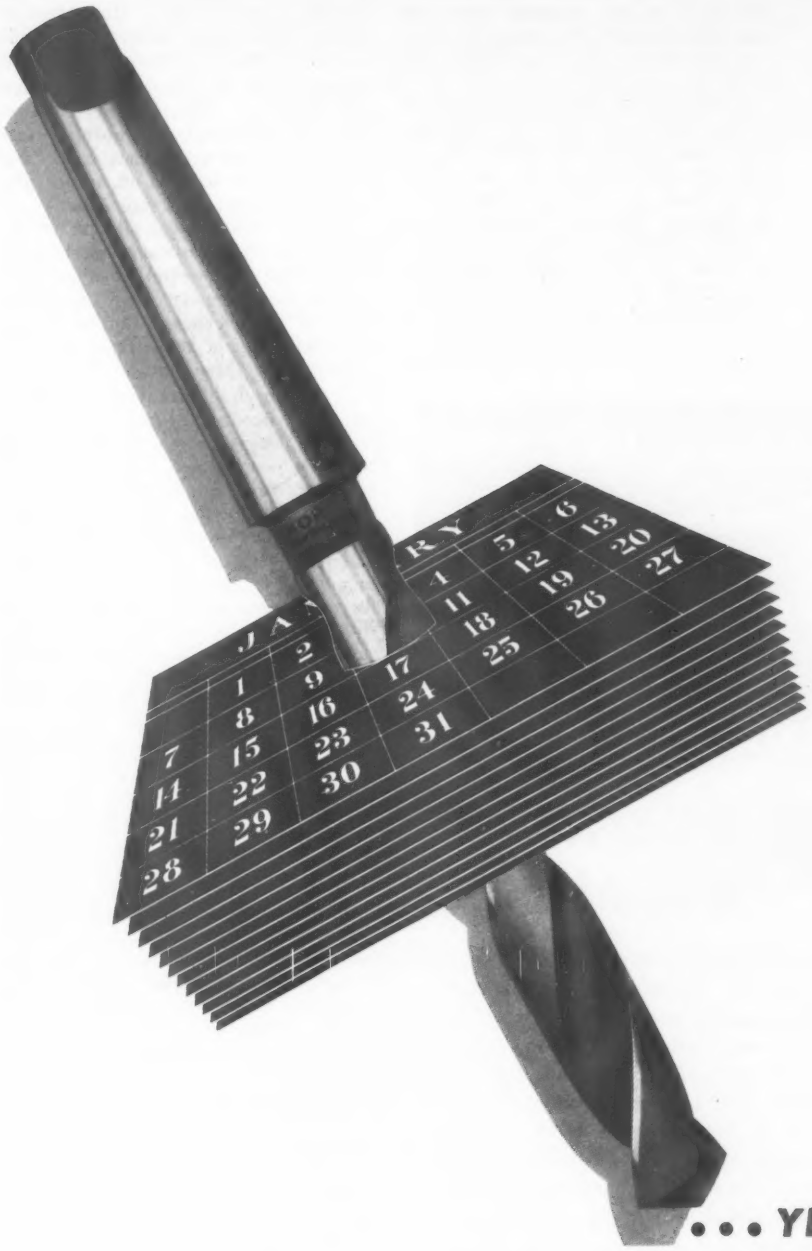
Everybody Pays Taxes

All individuals, whether wage earners, salaried workers, professional men and women, housewives, etc., pay taxes to the government. Excessive taxes lead to three distinct results: 1 (increased cost of living, 2 (reduced wages and dividend payments, and 3 (a less secure economic system under which we live. As stated above, some of these taxes are direct and others are hidden. Direct taxes are paid in the form of property taxes, income

(Continued on page 48)

GAIRING
END VIEW OF
HEXAGON DRIVE
Heavy Duty, Inverted
Spotfacers and
Counterbores
provide balanced drive with equalized strength. The pilot bar aligns the cutter. Hexagon socket in the cutter, co-acting with the hexagon pilot shank, assures a positive, sturdy drive that is capable of handling heavy cuts on castings and forgings. Pilots are supplied with straight or tapered shanks with keeper key slot.
Our long engineering experience . . . modern production facilities . . . complete stock of standard tools . . . all at your service.
Use them!
The Gairing Tool Co., Detroit, Michigan
In Canada, Hi-Speed Tools Ltd., Galt, Ont.
SPECIALISTS IN FINE CUTTING TOOLS FOR 24 YEARS

The heavy duty, inverted spotfacer and counterbore illustrated in the above advertisement is described in great detail on pages 28 and 29 of Gairing Catalogue No. 40. For complete information turn to those pages.



. . . YEAR AFTER YEAR,

constant improvement of Morse Drills has more than kept pace with the constant increase of production-machine capacities. As always, "There IS A Difference."

MORSE

THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

CAUSES OF UNEMPLOYMENT

(Continued from page 46)

taxes, payroll taxes, inheritance taxes, etc., while the indirect taxes are sales taxes of a wide variety.

If you own your home, you pay direct taxes. If you rent your home you pay indirect tax to the landlord in the form of higher rent. Whenever you buy bread or meat, you are paying the taxes of meat packer, the butcher, the baker, and the grocer, as their taxes have been passed on with the product to the consumer. If you purchase an automobile at a price of $783.00 the hidden taxes involved amount to $73.60, covering some 206 items not including the consumer sales tax. 134 of these taxes are federal and 72 are state and local.

According to the National Association of Manufacturers "Taxes and You" the single man, earning $18.00 a week and living in a furnished room, may think that taxes do not reach him. The Northwestern Life Insurance Company, however, has studied his budget, and states that even though he owns no property, out of his $960.00 a year income, he pays $116.00 in hidden taxes. This amounts to 12 per cent of his salary. Similarly a man supporting a wife and two children on $150.00 a month was found to pay $220.00 a year as taxes. High taxes seriously affect wages, salaries, dividends, and the financial reserves of companies.

Taxes must be paid before any other item of expense. This cash may be raised from the consumer by raising prices. This means that the consumer will buy less, production will fall off, and salaries will become lower and jobs fewer.

A comprehensive compilation for the fiscal year 1938, covering 163 business corporations representative of a cross-section of industry and employing 3,000,000 people, showed that an average of $576.00 is paid annually in taxes per employee by these 163 companies.

It is also significant to note, that in 1938, the dividends per common share in these corporations were $1.33, while the taxes per common share were $2.73. In other words, the Government took in taxes more than twice what was left as a return on the investment to those who had spent their money to build the factories and equip them with machinery, thereby providing an opportunity for employment and making possible the earnings and livelihood of 3,000,000 workers. It should also be remembered that after the inventor has received his dividends, he, in turn, has to pay a personal tax, so that the Government gets him coming and going.

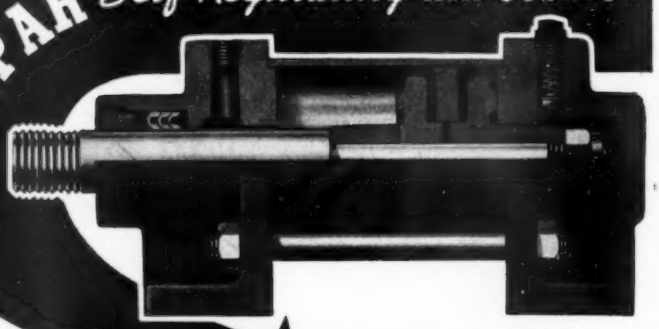
There is no end to the evidence that machinery is labor saving. The advance of technology has given us new commodities and services; it has increased wages, it has reduced prices; it has reduced the work week; it has practically eliminated child labor; it has reduced industrial accidents; and it has increased employment opportunities. The machine is man's most capable and productive servant, as well as the country's best tax revenue producer.

Prior to the invention of the automatic cigarette-making machine and its commercialization in 1909, there were something over 100,000 people engaged in making cigarettes. Making them largely by hand. Along came this highly mechanized device which was almost laborless. The number employed in cigarette making dropped from 100,000 plus in 1904 to less than 25,000 in 1935; a technological displacement of 75,000 people.

Secondary employment generated by the increased use and distribution of cigarettes which put thousands of clerks to work to take care of public demand for a cheaper and better cigarette is not discussed here. Uncle Sam, today, puts a consumer tax of six cents per package on each package of twenty cigarettes, retailing for approximately fifteen cents. Cigarette taxes brought the Government, in 1935 over $350,000,000.00 in taxes. Enough to pay a salary to an equivalent number of the displaced workers amount-

(Continued on page 50)

NOPAK *Self-Regulating* AIR CUSHION



Sectional View of NOPAK Air Cylinder with Self-Regulating Cushion.

What it IS . . .
What it DOES

The NOPAK Self-Regulating *Cushioned* Air Cylinder is *one* cylinder which requires no adjustment. The *cushioning action* at the end of each piston stroke is controlled automatically. As the piston sleeve enters the bore in the cylinder head, the air trapped between piston and cylinder-head acts as an air-cushion over the entire piston surface.

"Cushion" Remains Constant

The smooth, gradual, *cushioning action* (predetermined by the taper, tolerances and length of cushion-sleeve, and by exhaust-bore diameter) *remains constant* at all times regardless of stroke length or cylinder bore. There is no needle-valve to be frequently re-adjusted, to clog up, get out of order.

For Complete Data, ask for Bulletin 77

GALLAND-HENNING MFG. CO.
2757 South 31st Street • Milwaukee, Wis.
Representatives in Principal Cities

Other Advantages of Built-In Air Cushion

- Eliminates Damaging Metal-to-Metal Impact, Noise, Shock and Vibration.
- Prolongs Cylinder Life —Reduces Wear on Piston and Cup Leathers.
- Cuts Maintenance Costs.
- Provides Cushioned Air Cylinders in Non-Cushioned Price Range.
- Assures Smooth, Quiet, Efficient Operation at Low Cost.

There are 3 types of NOPAK Air Cylinders, (a) Self-Regulating Cushion (b) Adjustable Cushion and (c) Non-Cushioned. Each available in 6 standard mountings.

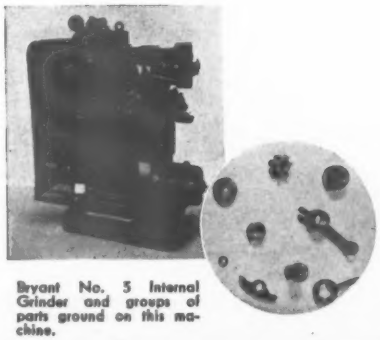
NOPAK VALVES and CYLINDERS
DESIGNED for AIR or HYDRAULIC SERVICE

A 3116-½

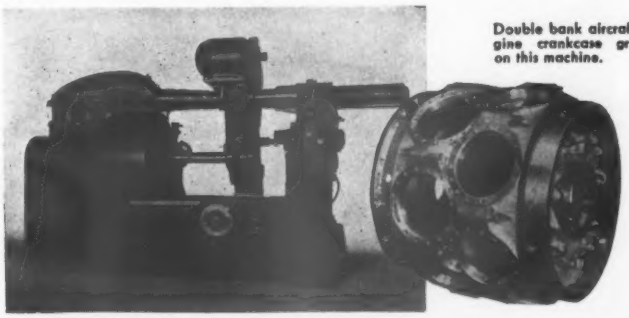
Very Small OR *Very Large*

GRIND THEM ON A BRYANT

THE Bryant line of Internal Grinders is suitable for grinding each size bore that may be required by the manufacturer's design. Any of these machines will produce finish and accuracy to satisfy every need. Straight and taper holes may be ground with standard equipment either separately or in combination with each other. Standard machines may be easily arranged to grind cams and out-of-round holes by adding the cam attachment.



Bryant No. 5 Internal Grinder and groups of parts ground on this machine.



Double bank aircraft engine crankcase ground on this machine.

Bryant No. 24 Internal Grinder with 36" swing.

BRYANT CHUCKING GRINDER CO., Springfield, Vt.

CAUSES OF UNEMPLOYMENT

(Continued from page 48)

ing to approximately $4,500 per man or woman per year.

Each dollar of increased taxation means one dollar less to reduce prices of products to consumers or to raise wages of workers.

Industrial Economy vs. Political Economy

What chance has an industrial economy, which makes average gain in efficiency of not more than three per cent per year against a political economy which eats up savings thru taxes at an accelerating rate of nearly 100 per cent per year?

"When the Government, as it does in New York State, slaps a tax upon the consumer of four cents on a gallon of gas, or approximately twenty-five per cent, it eats up the lion's share of the benefits which the gasoline industry would otherwise have passed on to the general public. The same thing is true when it puts a six-cent tax on a package of cigarettes which retails for fifteen cents. These taxes become a part of the direct cost of consumption and are borne by the consumers. They are only a visible fraction of the almost endless chain of taxation which reaches from the finished product all the way back to the raw material entering all our products."

The average worker thinks that he escapes taxation; but if an employer has to pay, as this compilation shows, some $375.00 a year for the privilege of employing each worker, the tax must ultimately come out of either the worker's wages or the price that he has to pay for the manufactured products. Ultimately, the consumer must pay the tax. In the meantime, however, great business enterprises may be ruined by excessive taxation; and unemployment follows as an unavoidable result.

"The restoration of the free flow of money through the capital markets into the expansion of productive plant and equipment is the central problem in economic reconstruction," as stated by Mr. H. W. Prentiss, Jr., President Armstrong Cork Company, on November 14, 1938. He continued, "We do not need any new industries to lead us from depression to prosperity or to provide productive outlets for the savings of the American people. All that we require is an economic and political situation favorable to the resumption of capital replacement and expansion in existing industries. The expansion of Capital required to replace depreciation and obsolescent plant and equipment and to raise standards of living even back to 1929 level is sufficient not only to provide outlets for available money savings, but also to absorb all our unemployment."

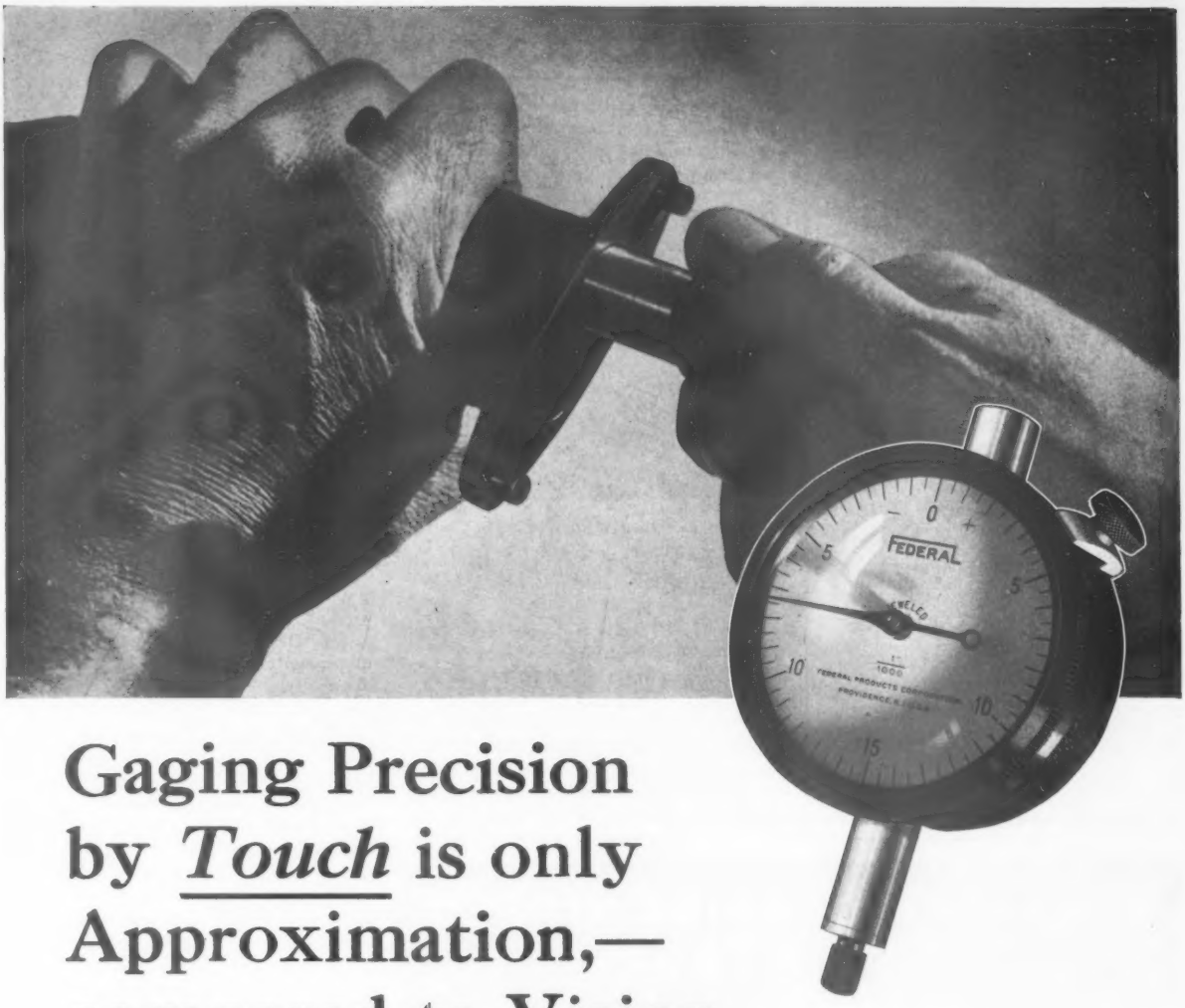
On February 11, 1939, Senator Robert P. Taft stated, "The only way to restore prosperity in the United States is to cure as far as possible the evil of unemployment. This can be done only by speeding up private agriculture, commerce, and industry to employ more people. Existing industry must be encouraged to expand. Individuals must be encouraged to spend their own time and their own money in developing new enterprises and new products.

"Roughly speaking, no one has invested either time or money in new enterprises during the past five years." The Executive Council, American Federation of Labor, Feb. 14, 1939, stated, "If the unemployed could be accorded the opportunity to work in private industry, the spending of millions for relief purposes would cease. This would mean that the burden of taxation could be reduced and the national income increased. The spirit and morale of the unemployed workers would be lifted to a higher basis."

In May, 1938, Senator Arthur Capper stated "According to the Brookings Institution, "when current requirements are added to the accumulated deficiency, the needs for durable goods over the next five years indicates an average annual production at current prices of approxi-

(Continued on page 58)

Local engineering service and warehouse stocks at principal industrial centers.



Gaging Precision by *Touch* is only Approximation,— compared to Vision

The sense of *feeling* or of *touch* as applied to fixed gages when used to determine the accuracy of specified sizes on machine parts, depends upon the sensitivity of the inspector and varies with each individual.

But, a visible indicating hand, moving over widely spaced dial graduations, is something which can be seen with the same degree of accuracy by *anybody*.

This fact is one of the strongest reasons for using Dial Indicators even for comparatively large tolerances. Send for catalog.

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THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT, MICH.

CARBIDES

(Continued from page 22)

but the speeds and feeds are interesting: 680 R.P.M.; 6-inch table feed per minute; depth of cut, .007; number of pieces per grind, 375.

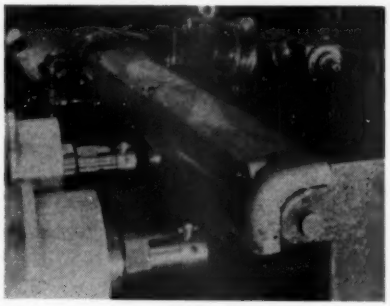


FIGURE NO. 22

Figure 23—Turn face and bore at 8-foot diameter cast steel gear, 40 to 45 carbon: Surface speed, 85; feed, 1/8; depth of cut, 3/4; 18 hours to do the piece; took 38 hours with high speed steel.

These examples are intended to indicate that carbide tools are being successfully used today as general purpose tools rather than single purpose tools and are being widely applied for steel cutting.

Just one more word about the economies of carbide use. It has been said, and

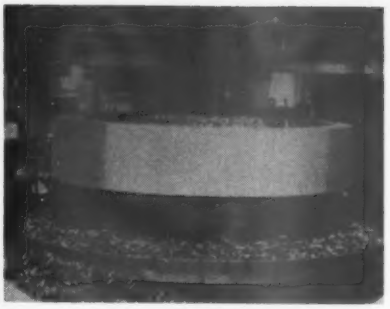


FIGURE NO. 23

I think rightly so, that cemented carbide is best classified as most vital to United States industry, the reason being that it takes so very little to accomplish quite a lot. Generally speaking, and from information given to us by users of general purpose carbide tools in the last year and a half I can say that those who have applied carbide tools as general purpose tools have reported to us savings in machining costs in the order of 25% and, what is particularly important at the present time, increases in machine capacity in the order of 33 to 43%. In other words, they did their work quicker so they were able to use their machines a third to 43% more of the time. Right now that is important when machine tool deliveries are where they are.

In time of war this carbide is a strategic material. I am confident that I am right when I say that it is the easiest way to increase production that is known in this country today in the cutting of metals. And recently I have been in contact with some of our European friends who are selling and manufacturing this type of material, and I want to tell you that if it were not for carbides in the European market today they would be severely handicapped in the present war.

To conclude, I would like to make a prediction, just a slight prediction, and that is this: With carbides increasing in their value to American industry, in the next eight or ten years, the way they have in the past, I am confident that we will be doing in metal cutting with carbide in four days what it now takes us five to do.

HIGH SPEED STEELS

(Concluded from page 42)

favors the Molybdenum, but this is slight, and does not enter seriously into the cost of a complex tool. Molybdenum steels can stand on their own feet on a competitive performance basis.

Lest you feel that my ideas concerning the Molybdenum High Speed Steels are unduly prejudiced, I might say that they are solely the result of many years of actual experience in their use on all types of tooling. I unfortunately do not own any shares of stock in a Molybdenum producer. I am probably also guided by a desire to see a domestic product used to the full extent of its possibilities.

TUNGSTEN CARBIDE TIPPED SPECIAL TOOLS

EXAMPLES OF SPECIAL CARBIDE TIPPED TOOLS OF OUR DESIGN AND MANUFACTURE

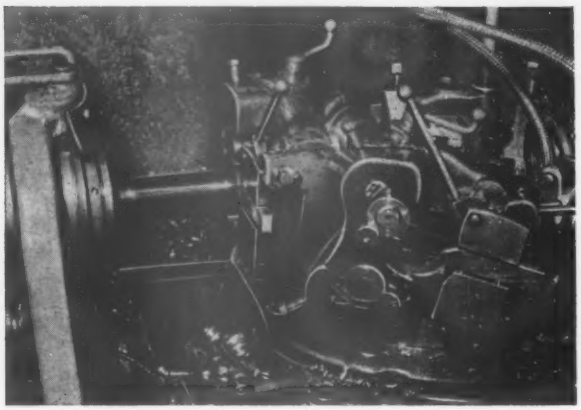
MAKE USE OF OUR EXCELLENT ENGINEERING AND PRODUCTION FACILITIES

STANDARD TOOLS—SPECIAL TOOLS
CARBIDE BLANKS—CARBIDE TOOL SALVAGE
SPECIAL APPLICATIONS *ASK FOR OUR NEW CATALOG NO. 40*

SUPER TOOL COMPANY
21650 HOOVER RD. DETROIT, MICH.

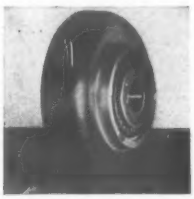
Because *they reduce the cost per piece machined—*

HAYNES STELLITE ALLOY TOOLS *are* STANDARD *on these Automatic Jobs...*



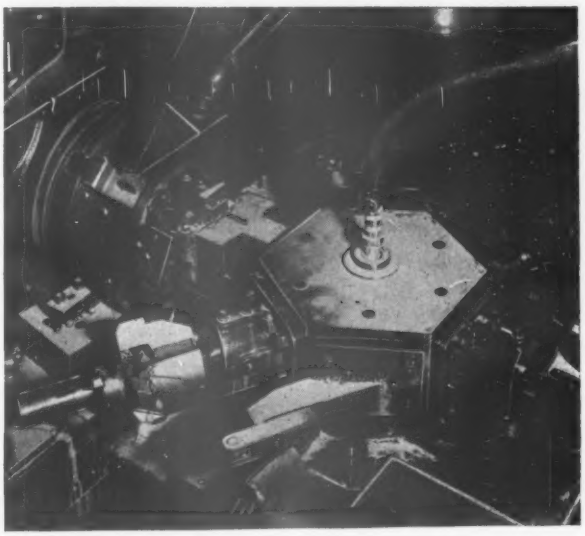
179 BRINELL HARDNESS—Turning, boring, facing, and undercutting forged SAE 2315 steel ring gears with Haynes Stellite J-Metal solid tool bits at 144 surface feet per minute with a feed of 0.024 inch per revolution.

SAE 4640 STEEL—Rough turning bar stock for machine tool drive shaft sleeves with Haynes Stellite J-Metal solid tool bits at a speed of 125 surface feet per minute and a feed of 0.015 inch per revolution.



Haynes Stellite Specialties

This burnishing roller for locomotive axle journals is typical of the special Haynes Stellite alloy parts which are used where high resistance to abrasion, corrosion, and heat are required. For information write Kokomo, Indiana, or the nearest district office—Chicago, Cleveland, Detroit, Houston, Los Angeles, New York, San Francisco, Tulsa.



6½ MINUTES FLOOR TO FLOOR—Rough and finish turning, boring, and facing a 12-9/16-inch O.D. forged SAE 4620 steel internal drive gear with Haynes Stellite "2400" solid tool bits at 256 surface feet per minute.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Indiana

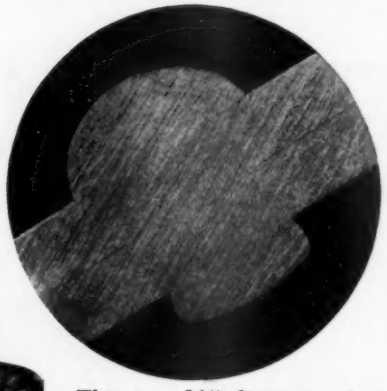
Red-hard, wear-resisting alloys of cobalt, chromium and tungsten

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

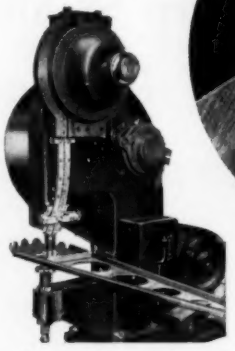
The words "Haynes Stellite" and the designation "2400" are trade-marks of Haynes Stellite Company.

for rigid joints that won't loosen

- ✓ a completely filled hole
- ✓ no flashing
- ✓ a neat, balanced head



put in at an average rate of 1500 per hour. Approach to the maximum of 3200 per hour depends on the ease with which the work can be handled.



This is a ¼" diameter rivet joint section—enlarged. You can see for yourself just how rigid these joints are. Send along two or three samples of your work, a handful of rivets and specify the type of riveted head required. They will be "RIVITORed" promptly and returned for your inspection.

the RIVITOR

shown here setting aluminum alloy rivets in aircraft wing sections. Write for information on the RIVITOR'S use in the aircraft industry.

address The Tomkins-Johnson Co., 624 N. Mechanic St., Jackson, Mich.

this is a TOMKINS-JOHNSON product

RACINE

ANNOUNCES!

A NEW

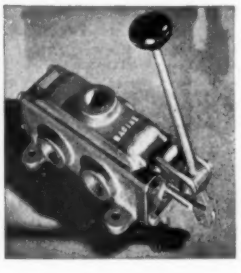
VARIABLE VOLUME HYDRAULIC PUMP

RACINE announces its new 1000-lb. Variable Volume Pump. Advanced in design and construction, it incorporates the special advantages of smooth, quiet operation—needle roller bearings—mechanical seals. An exclusive method keeps vanes hydraulically balanced. Hydraulic governor automatically maintains desired pressure without by-passing of oil.

CAPACITIES—12-20-30 gallons per minute.
VARIABLE PRESSURES—Up to 1000 lbs. per sq. in.
MOUNTINGS—Foot or flanged type.

Let our engineers help you with your hydraulic problems; send for literature today.

RACINE HYDRAULIC VALVES



Engineers and designers, you are offered a complete service for oil hydraulic systems—Variable Volume pumps—Feed controls—Pressure regulators. A complete line of hydraulic valves—Manual—Pilot—or Electrically operated. Let RACINE assist you with your hydraulic problems.

RACINE TOOL & MACHINE CO.
1777 State St. Racine, Wis.

SEND FOR COMPLETE DATA — TODAY!

HIGH SPEED TOOLS

(Continued from page 28)

care to see that the tools are correctly ground during the process of manufacture in regard to rake, clearance, etc., as well as producing the highest possible grinding finish. In many cases the users of tools are not properly equipped to re-grind tools satisfactorily or do not employ experienced operators to perform this important function, resulting in these re-ground tools producing a smaller number of pieces before dulling than when originally received, as well as at times giving an unsatisfactory finish. One of the large grinding machine companies recently worked very closely with a manufacturer in one of the New England states who sought information relative to re-grinding of their tools, due to the fact that their re-ground tools did not perform nearly as satisfactorily in their plant as the tools originally received. They were able through the co-operation of the grinding machine manufacturer to so re-grind their tools that they produced many more pieces per grind, being comparable with the production obtained from the tools originally received as well as obtaining a better finish.

It is interesting to note that many of our industrial plants have so-called Central Tool Grinding Cribs where only experienced operators having the proper grinding machines and fixtures are allowed to re-grind all of the cutting tools used in the plant before being placed back on the job or in the crib. As a result of this action these companies report a worthwhile savings in their tool costs during a period of a year's time.

Under this subject comes also the proper handling and storage of tools in the user's plant. These fine edge tools deserve all possible care in regard to proper handling and storing so as to prevent knicking of the cutting edges and similar abuse.

In conclusion we can cite many cases where through the proper *selection, use and care of high speed steel cutting tools*, a splendid savings in tool costs is affected. One of our nationally known companies with factories from coast to coast advised the speaker some time ago that the savings effected through watching these three important factors ran well over $50,000 yearly.

A New Dress This Month

Perhaps, Mr. Tool Engineer, you've noticed the "new dress" your TOOL ENGINEER magazine is wearing this issue.

New type faces, heavier covers, and other important changes have been made to improve the publication for your easier reading, instruction and enjoyment.

A new addition to the editorial staff is also being made, about which we will tell you at an early date, so as to provide an ever increasingly better quality of material to present to you.

Getting Salesmen's Co-operation

Tying in Advertising with Selling

Getting out into the field

Copy Testing

DIRECT MAIL

Layout, Copy and Illustration

Market Information

contributing to the solution of general company problems

Readership of Publications

Measuring Results

ALLOCATION OF BUDGETS

Programs that management will approve

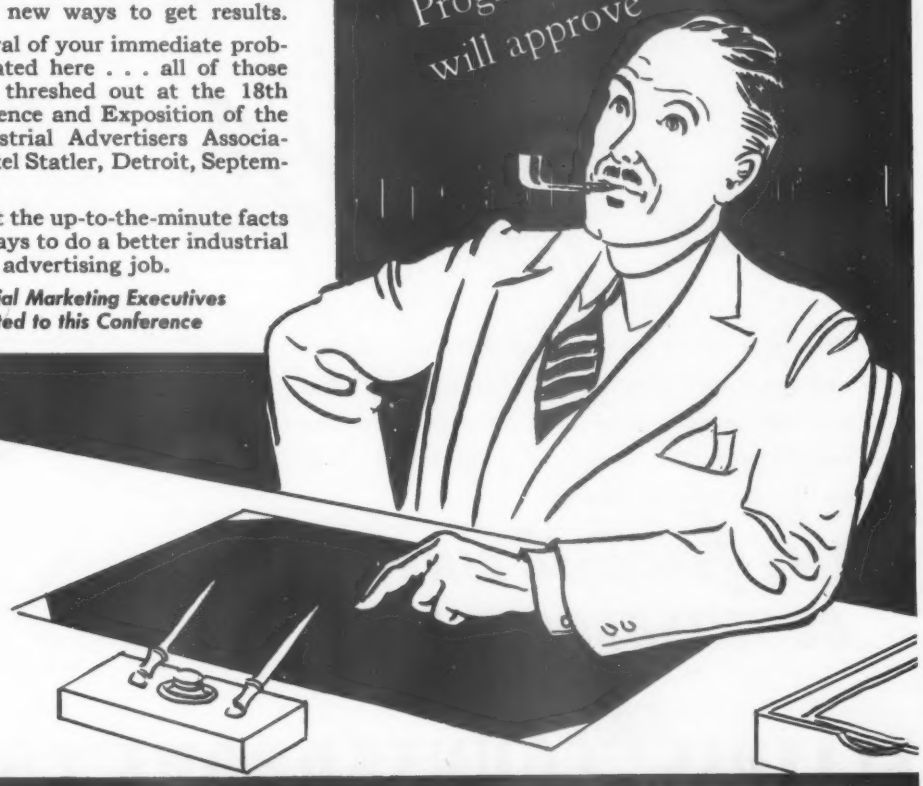
WHAT'S YOUR PROBLEM?

Your business . . . in at least one respect . . . is no different from others: *Your marketing problems are constantly changing.* You must ever be on the search for new ideas . . . for new ways to get results.

No doubt several of your immediate problems are indicated here . . . all of those shown will be threshed out at the 18th Annual Conference and Exposition of the National Industrial Advertisers Association, at the Hotel Statler, Detroit, September 18, 19, 20.

Plan now to get the up-to-the-minute facts on the latest ways to do a better industrial marketing and advertising job.

All Industrial Marketing Executives are Invited to this Conference



NIAA
NATIONAL INDUSTRIAL ADVERTISERS ASS'N.

1940 INDUSTRIAL ADVERTISING CONFERENCE

DETROIT . . . HOTEL STATLER . . . SEPTEMBER 18, 19, 20

A.S.T.E. DOINGS

(Continued from page 36)

RACINE

The Racine Chapter held its annual frolic and banquet at the Meadowbrook country Club on Friday, June 14. Mr. Forrest F. McGuire Executive Secretary of the Racine Manufacturers' Association spoke on the seriousness of the situation as regard to our military defenses, Fifth Columnists, etc.

The Chicago Machine Tool Salesmen were challenged by the members of the Racine Chapter in the Golf contest. The results were Chicago, 798 strokes as against Racine's 728. The Racine "Birdy-Boys" were running true to form and came through with flying colors, and will give the Chicago salesmen an opportunity to regain the lost honors at next year's Frolic. Bill Davidson won the Grand Prize for low medalist with a score of 80.

It has always been customary in the past for at least one national officer to address the Chapter. Mr. E. W. Dickett was scheduled for this assignment this year, but he failed to show up on account of being married the day previous and was on his honeymoon. It seems that this marrying business is contagious as Adolph Zaborowski, our Chairman, also announced his forthcoming marriage. The program Committee has served notice and a fair warning that a careful inquiry will be made next year as to whether or not the various speakers and contestants have any nuptial ideas in mind, before making up the program.

Nelson Watkins of the Jones & Lamson Company, playing with the Chicago salesmens' team, turned in the best score for that group and beat his opponent, Ralph Smith of the Racine team by one stroke.

The Frolic was a grand success in every way. The weather was ideal. Everyone had a good time and it will be long remembered as one of those great days for good fellowship, renewing old acquaintances, making new ones, and an opportunity for real fun as Racine Chapter is well noted for.

MILWAUKEE

The June Meeting of the Milwaukee Chapter was held on June 13 at Hanman's Place. Approximately 125 were present at the dinner. Mr. Harold Heywood introduced Paul E. Butzin who gave a short talk and then introduced Mr. R. W. Melius of the Delta Mfg. Company who also gave a short talk on the Delta Mfg. Company. After hearing from these two gentlemen, the group then left for a plant visitation at the Delta Mfg. Company, which was enjoyed by all.

TRI-CITIES

Tri-Cities Chapter held its June Meeting on June 5 at LeClaire Hotel, Moline, Illinois. Seventy-one members and sons assembled for dinner. After disposing of the fried chicken dinner, a greeting was given the sons, and announcement made for the daylight excursion on the new Streckfus pleasure boat—"SS President," which is planned for August 17 and is open to all friends and technical organizations.

After a short recess during which members inspected the educational exhibits, Mr. J. W. Burdette of the U. S. Secret Service Department was introduced. He outlined the activities of his department and presented a very interesting moving picture titled "Know Your Money."

Mr. E. G. Crane was then introduced and talked on "Modern Tool Crib Control," outlining a method of issuing tools without using the time-honored "brass check" system.

During the evening a collection was made for the American Red Cross War Relief Fund which totalled $12.61.

Also a guessing contest conducted by the Keystone Lubricating Company was won by Mr. H. W. Anderson of the Eagle Signal Corporation of Moline, Illinois. The prize was five gallons of motor lubricating oil.

ELMIRA

The Elmira Chapter of the American Society of Tool Engineers and the American Society of Mechanical Engineers held a joint meeting in the Blue Room of the Langwell Hotel, Elmira, on June 14.

After an enjoyable dinner, the forty-one members present were honored by a very outstanding, illustrated lecture on "Hydraulic Applications to Machine

(Continued on page 64)

Cure for the heat!

We know what you are up against—orders and pressure—they've turned on the heat! But you can lighten your load by turning to the counterbore line that has established itself as the industry's leader.

THE fastest LINE OF COUNTERBORES MADE

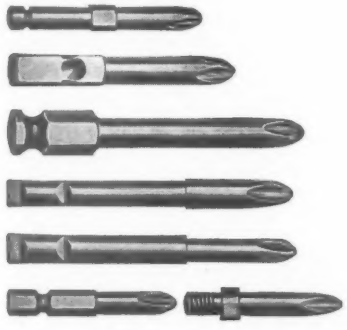
ECLIPSE COUNTERBORE COMPANY

DETROIT • MICHIGAN

APEX
POWER BITS
for high speed production

When you are working your tools hard and trying to make time on heavy production, you want to eliminate as much as possible time out for changes due to broken bits.

APEX POWER BITS will cut down lost time to the minimum on the screw-driving end of your work. The Bits are made of special steel that is shock-and-wear-resisting. The machine work is accurate—tolerances are close. The Bit is heat-treated to obtain the maximum in hardness, toughness and wear-resistance for the job it has to do.



APEX POWER BITS for both Phillips recessed head Screws and Slotted Head Screws are made for nearly all makes of electric, air and spiral drivers.

Nearly all American aircraft and automobile manufacturers, as well as other industries, are regular users of Apex Power Bits, for both Phillips Screws and Slotted Head screws.

Here's how some users work it; they build up a bank of Apex-Phillips Power Bits. As the Bits become worn or unserviceable, they are returned to APEX for reconditioning. Each reconditioning shortens the Bit approximately 1/8" and the reconditioned Bit is equal to new: the cost is moderate. In this way, they have a stock of all size Bits for all drivers instantly available.

A copy of the APEX Manual and Catalog No. 11 is available for the asking.

The
APEX MACHINE & TOOL
Company
503 E. Third St. Dayton, Ohio

GLENCO
FLOATING TOOLHOLDER
Corrects Machine Tool Misalignment By Producing TRUE and ACCURATE Holes

Also Manufacturers of

Utility Tools

FLOATING HOLDERS
SPOTFACERS
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REAMERS
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TAP CHUCKS
DRILL CHUCKS
ADJUSTABLE ADAPTERS
ADJUSTABLE EXTENSION ASSEMBLIES
QUICK CHANGE CHUCKS
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SPACING COLLARS
ARBORS
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WOODRUFF CUTTERS
CORE DRILLS

THE J. C. GLENZER CO.
DETROIT MICHIGAN

SHELDON
Back Geared Screw Cutting
PRECISION LATHES
SHELDON
A complete line of modern, yet moderate priced 10", 11" and 12" Back Geared, Screw Cutting Precision Lathes, each with a full complement of attachments, accessories and drives.
SHELDON MACHINE CO.
CHICAGO, U. S. A.

These are quality Lathes, built to industrial standards, with full weight, hand scraped, semi-steel bed, hardened spindles ground all over (even the spindle nose thread is ground) and phosphor bronze bearings. Ideal for tool rooms, machine shops and second operation production work.

See the SHELDON before you buy.

Write for catalog.

SHELDON MACHINE CO.

1619 N. Kilbourn Ave., Chicago, U.S.A.

CAUSES OF UNEMPLOYMENT

(Continued from page 50)

mately 35 billion dollars, whereas actual production in 1936 ran at the rate of about 21 billion and is now even lower. In terms of employment, the difference of 12 billion dollars represent the addition of some 8 or 9 million persons (to the ranks of those employed) on a full-time basis and this applies merely to the durable goods industries. We are led to the conclusion that a production program of sufficient magnitude to replace accumulated deficiencies within the next five years and expand output to a level that would provide a consumption commensurate with that in 1939 would be faced by a shortage of labor."

"There is the answer, Business spending, not government spending, is the road to reemployment."

First, these taxes cut down consumption, as the substantial portion of the average consumers' dollar is buying more and more government and less and less goods and services.

HANDY ANDY SAYS—

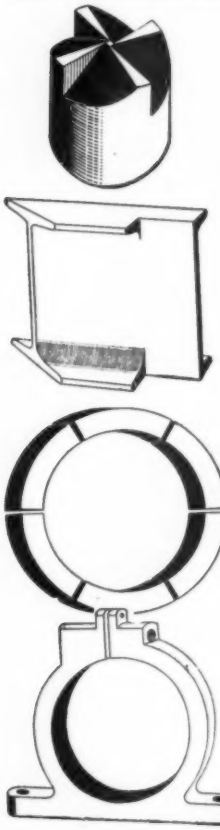
(Continued from page 40)

it from me to presume to advise you about running the Country—although you have my okay on appt. of Messrs. Knudsen, Stettenius etc. and Col. Lindberg and Cap. Rickenbacker—but, Sir, I would just like to make a little suggestion. That is, that you can depend on Ford, G. M., Chrysler etc. to turn out the planes, tanks, trucks and so on they say they can make, only, don't cramp their style in turning our automobiles, too. You see, Sir, a lot of us are hoping that the "submerged third" will now rise to the occasion and go to work, which as you know makes that many more to buy homes, cars, radios, washing machines and have their tonsils out. In brief, we're due for a boom, only, I'd like to have it so it won't collapse on us with Hitler sitting on top of the pile and dominating our markets. That son-of-a-gun has it all written down in a book and he hasn't lied—MUCH—except in his non-aggression pacts and such.

Well, that's all for now and thanks for reading this; you know, we can do great things if we just get our heads together. For to God, the President and The Tool Engineers nothing is impossible. With best personal regards to you and the family, I am

Very Respectfully Yrs.
HANDY ANDY.

Have you a "pet peeve" about something you don't like about TOOL ENGINEER? If you have—why not write us a letter—we'd like to know about it. Do it now.



1

Here is a roughing-out job on a milling tool quickly and accurately sawed out, using dividing head and chuck. Hundreds of similar operations such as sawing out shanks on drop forged dies, squaring ends of round stock, and sawing double angles can be done in half the time and expense of planing, shaping or milling, *and no metal is wasted.*

2

An I beam mitered at one end and coped at the other end. This kind of work can be done faster, more accurately, and more economically with a MARVEL No. 8 Metal Band Saw. It will cut off square, miter and cope any bar shape from the smallest moulding to 18" I beams. Large planer type bed obviates need for special setting up.

3

Index cutting and splitting clamp rings, connecting rods, bushings, collets, etc., is a simple operation on this machine which features perfect control, quick chucking facilities, accuracy and speed. Large work table accommodates rings for segmenting of almost unlimited diameter. These few suggestions do not begin to cover the practical time-saving operations that the MARVEL No. 8 will do. And it is ready, always, for almost any conceivable job of straight cutting-off, with its large capacity range of 18" x 18". It is truly an investment in production economy.

THE ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave.

CHICAGO, U. S. A.

Eastern Warehouse and Sales: 199 Lafayette St., New York

ALL IN THE DAY'S WORK

FOR THIS UNIVERSAL ALL-PURPOSE SUPER-CAPACITY METAL BAND SAW ★

MARVEL NO. 8

Having difficulty holding tolerances?

FLOATS RADIALLY

DEMAND THE

ZIEGLER

ROLLER DRIVE

Floating Holder

for

Taps and Reamers

AUTOMATICALLY compensates for machine spindle misalignment, eliminating over-sized or bell-mouthed holes.

Helps produce unbelievable accuracy on both new and old equipment.

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

W. M. ZIEGLER TOOL CO.
1920 Twelfth Street DETROIT

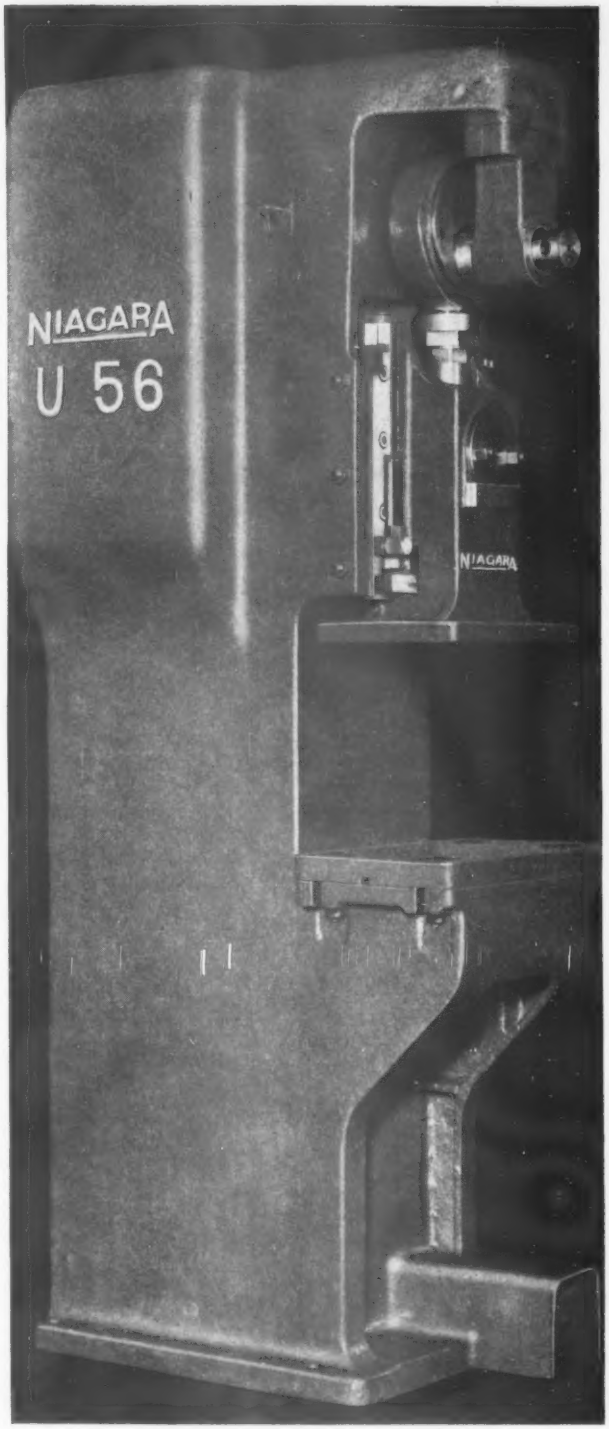
ARMSTRONG

Drop Forged WRENCHES

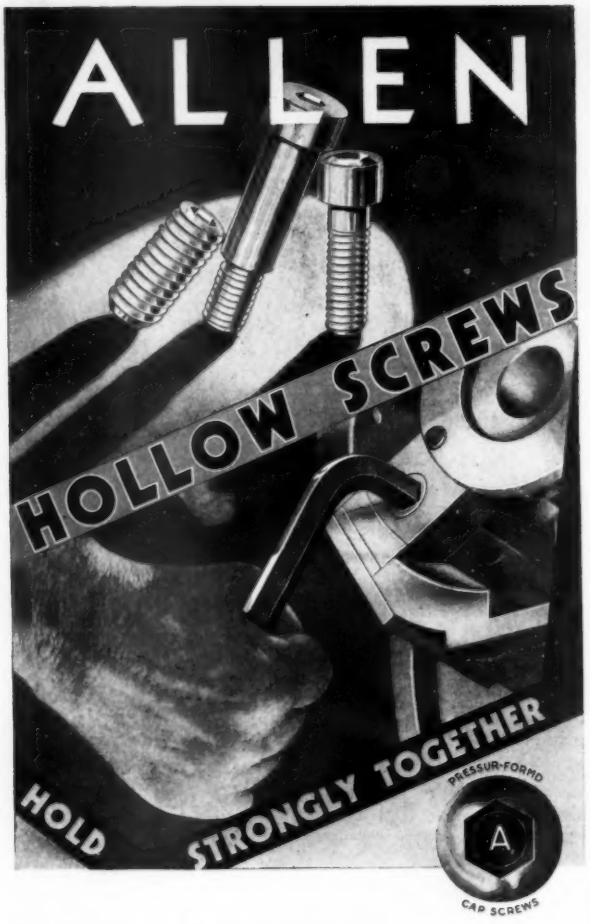
For industrial use and wherever quality counts ARMSTRONG WRENCHES are preferred for their extra strength, improved designs, finer steels, correct heat treatment, accurate openings and better balance.

Over 100 types, each in all sizes. Drop Forged Carbon and Chrome Vanadium Steel Open End and Box Socket Wrenches . . . Chrome Vanadium Detachable Head Socket and Hollow Screw Wrenches . . . Great Construction Ratchets . . . Special Wrenches of all types on short notice — standardize on "ARMSTRONG WRENCHES" they are the finest obtainable. Write for Catalog C-39.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
360 N. Francisco Ave. Chicago, U. S. A.
Eastern Warehouse and Sales: 199 Lafayette St., New York



Series "U" and "UA" Niagara Punch Presses combine modern streamlined appearance with the latest developments in engineering practice. The inherent mechanical advantages of box sections have been skillfully combined with smooth modernistic appearance so as to obtain an oil tight enclosure for anti-friction bearing mounted gearing, main shaft bearings, pinion shaft bearings and clutch mechanism. Even the motor, and the "V" flat drive is mounted within the box section frame. When rearrangement of the production line is needed, it is a simple matter to move these machines because of their compact design. Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. Branches: Cleveland, Detroit, New York.



Duty-bound

— to hold *without fail* the assembled parts of machines, their adjustments and set-ups;

— to *speed up* assembling and setting-up, by use of hand, spiral or power drivers applied to the Allen hex keys;

— to help simplify machine design, by means of STRONGER *hence smaller* screws, smaller machine parts, streamlined compactness;

— to serve as "little pillars of strength" *upholding* production schedules all through your shop . . . Ask for samples to test for the qualities *YOU* want most.

Your local Allen Distributor will oblige with samples and SERVICE.

THE ALLEN MANUFACTURING COMPANY
HARTFORD, CONN., U. S. A.

PRODUCTION PERSPECTIVES

(Continued from page 32)

JOHN J. BORRUP, factory manager of Pratt & Whitney Aircraft at East Hartford, Conn. has been advanced to production manager and will be responsible for the supervision of the work of both the East Hartford plant and the subcontractors making parts for the Pratt & Whitney motor. The promotion was announced by H. M. Horner, general manager, G. H. D. Miller has been advanced to factory manager and Daniel Jack to assistant factory manager.

An $8,000,000 addition to the East Hartford, Conn., plant of Pratt & Whitney division of the United Aircraft Corporation is to be started at once. It is the first major plant expansion in the nation's aircraft industry announced since President Roosevelt launched the vast airplane building program last week. Work is going to be rushed on the project so that it will be ready for early in 1941.

Detroit A.S.T.E. member Bill Scheer, since 1935 Sales Manager of Swedish Gage Company of America, Detroit, Michigan, resigned July 1. Operating under his own name he will start out in St. Louis, Mo., as exclusive representative for several well known manufacturers of machinery and metal cutting tools. Bill is an old resident of St. Louis, having worked for Wagner Electric Corporation until 1928.

Mr. W. L. Gourley, was elected President of the Lehmann Machine Company, St. Louis, Missouri. Mr. Paul Lehmann, former President, who has disposed of his interests in the company will remain with the firm for the next year.

Earl T. Richards for many years with F. P. Sheldon & Son, textile engineers of Providence, R. I., is now associated with the plant engineering department of Brown & Sharpe Manufacturing Co., Providence.

Industrial Relations Committee A.S.T.E.

PERSONAL SERVICE FOR MEMBERS

SITUATIONS AVAILABLE

MANUFACTURING COMPANY IN NEW JERSEY, engaged in Mechanical Engineering and Contract Manufacturing—Has opening for shop foreman or superintendent.

CORPORATION IN NEW JERSEY has opening in Engineering Department for Tool Designers, Machine Designers, and Tool Design Supervisor. This firm is interested in receiving the record of experience of applicants in order to make a proper choice.

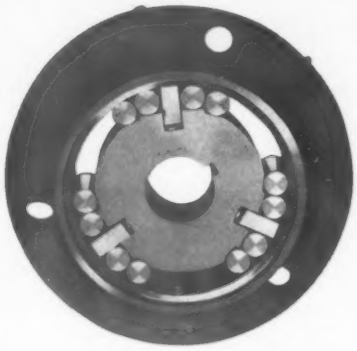
SITUATIONS WANTED

DETAILER—TOOL DESIGN—Has had proper training and has had some experience, seeking employment in Detroit area.

TOOL & DIE DESIGNER, SPECIAL MACHINE DEVELOPER, with twelve years' experience, anxious to make a change in employment, prefers to locate in Chicago area. Is willing to consider other location if conditions are suitable.

MAN WITH WIDE EXPERIENCE AND PROPER TOOL EXPERIENCE background has worked as Tool Maker, Inspector of Tools and Equipment, Supervisor of Engineering Department, Assistant Chief Draftsman, Tool Designer and checker, Supervisor of Tool Room, and Chief Tool Supervisor. Available for Supervisory work. Prefers New York—New Jersey Area. Available for interview.

For further information contact American Society of Tool Engineers, Tyler 5-0145, Detroit, or write to 2567 West Grand Boulevard, Detroit, Michigan.



A NEW FIXTURE LOCK

The modified double action lock specially designed for holding heavy top plates against gravity. Smooth operating and positive clamping in the down position. Do not confuse with double action lock which gives a positive or combination lock in both directions.

WRITE FOR INFORMATION

SWARTZ TOOL PRODUCTS CO., INC.

5259 Western Avenue — Detroit, Michigan

"OK" FOR EXACTING ARMAMENT WORK

OR WHEREVER PRECISION, SPEED AND ECONOMY COUNT!

Handling war work speedily and efficiently without sooner or later having to slight, and most likely lose, old customers is a poser that now faces many metal cutting departments. As many plants are still operating with the metal cutting equipment of a decade or more ago, relief could very well lie in the prompt replacement of all solid metal-cutting tools with the modern, inserted-blade types shown here.

These tools were designed especially to speed up and improve the milling, reaming and boring demanded in the exacting manufacture of airplane and armament parts. For economy, only the blades are made of the more expensive cutting steels. The bodies are made of chrome nickel steel, specially heat treated for strength. Because of their great flexibility of use, these tools afford savings in many directions. The blades are quickly and accurately adjustable in line of wear, so that trueing up a tool is a simple matter. Much time is also saved by having on hand a full assortment of properly shaped, freshly ground blades. These are always promptly available from the wide variety we carry in stock.

THE O K TOOL COMPANY, SHELTON, CONN., U.S.A.

INSERTED-BLADE METAL CUTTING
TOOL SYSTEM

This complete set of Johansson Blocks in a case — 81 blocks — costs only $285. Combine to make over 120,000 different size gages. Accurate to within ±.000008 inches. Also available accurate to within ±.000004 inches and ±.000002 inches.

Now you have to
SPLIT
THE SPLIT HAIR

● With demands for precision in the 1940 contracts more exacting than ever before, your need for Johansson Gage Blocks is greater than ever before. They are unexcelled as a means for achieving—and maintaining—the highest precision.

MOST JOHANSSON BLOCKS ARE AVAILABLE CHROME-PLATED

Write now for the free catalog listing all sets, prices and precision accessories. Individual blocks as low as $3.50. You will find the blocks listed that will help you meet the new demand.

JOHANSSON DIVISION
FORD MOTOR COMPANY
Dept. J, Dearborn, Michigan
Please send me free Catalog No. 15.

Name_____
Address_____
City_____ State_____

July Meetings

SPECIAL NOTICE

July and August are vacation months in the Tool Engineers' calendars, it seems. Only one meeting notice has been sent in for publication and this appears below. There are a number of outings, golf tournaments and other outdoor events scheduled for these months. If you don't want to miss any of these excellent opportunities for a good time, contact your nearest chapter Secretary, as listed on the title page of this issue for full details as to time, date and place of your chapter's vacation events.—Editor.

DAYTON

July 8th, 1940
Inland Gun Club—6:30 p.m.
Outdoor Meeting and Fish Fry.

HY-MAC

"and specify a 'Hy-Mac' hydraulic power unit, then you know the Hydraulics will be O. K."

Builders of
SPECIAL HYDRAULIC MACHINERY
Hydraulic Power Units
Hydraulic Conversions of Machinery

Write for further information.
HYDRAULIC MACHINERY, INC.
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Detroit, Mich.

MAC-ITS Save on Production, Maintenance and Design!

Stronger, more accurate screws can end many tie-ups—save labor and replacements—and cut costs all along the line when your designs take advantage of their greater strength.

Mac-its give you all these savings in 16 standard items. For complete details, call your Mac-it distributor or write today for your copy of Catalog 38, listing the only complete line of heat-treated, alloy steel screws!

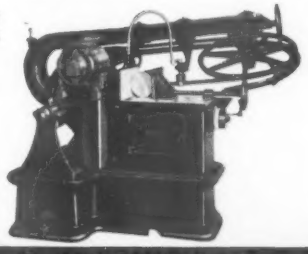
THE STRONG, CARLISLE & HAMMOND COMPANY
1392 West Third St., Cleveland · Ohio

NAPIER
BAND SAWS
METAL CUTTING

Made from specially selected steel with teeth accurately milled and set on specially designed machines insures accuracy and true cutting.
Hardened to teeth roots firmly fixes this accuracy in the bands but leaves the back flexible to withstand wheel tension and minimize band breakage.
Tempered to hardness best suited to specific metal insures maximum band life.
All widths and pitches in coils or cut to length and electrically welded.

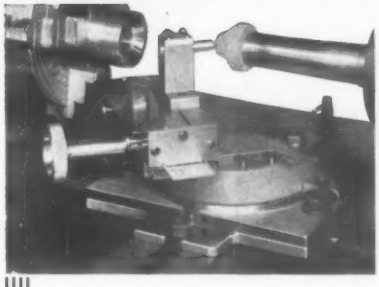
HORIZONTAL NAPIER BAND SAW MACHINES
for
ACCURACY
ECONOMY
LONG LIFE
LOW UPKEEP

Write for Circular and Price List



METAL SAW & MACHINE CO. INC.
40 NAPIER STREET SPRINGFIELD, MASS.

VINCO *Angle Tangent to Radius* DRESSER



For WHEEL DRESSING On ANY TYPE GRINDER

The Vinco Angle Tangent to Radius Dresser is universal in its application. Diamond holder posts are interchangeable. This permits its use on your surface, external, cutter, and internal grinders. Illustrated above is the dressing of angles and radii on a Heald Internal Grinder.

On your grinders, the Vinco Dresser will meet any of your forming requirements. It will reduce the time ordinarily required to dress your abrasive wheels and cut dressing costs as much as 75%. It can be depended upon for long, trouble-free service. It will always provide dressing accuracy to within .0001".

Write for Fully Descriptive Literature

VINCO TOOL COMPANY
9115 SCHAEFER ROAD • DETROIT, MICH.

A.S.T.E. DOINGS

(Continued from page 56)

Tools," by Mr. Clarence C. Stevens the well-known mechanical engineer of the New Departure Division of General Motors. The lecture led to a very instructive discussion in which a number of the members took part.

This brings to a close our meetings until next fall. We are all anticipating the time when we shall again meet.

LOS ANGELES

Los Angeles Chapter's May dinner meeting at Scully's Cafe on May 23 was attended by ninety members who noticeably enjoyed a talk on "Forgings and Forged Tools in Industry" by M. B. Pendleton of Plomb Tool Co., tracing the development of forging practice from the days of Tubal Cain through the medieval age of Damascus and Toledo blades, Mr. Pendleton entertainingly carried his hearers through the various power applications to this ancient art.

A very fine display of forged tools showed examples of the specialized needs of some industries; such as the copper-plated line of wrenches which have eliminated the sparking hazard in the oil industry.

Southern California Tool Engineers were also quick to note the speaker's statement that a rapidly rising increase over the 4% of national forging production given to the air-craft industry could probably be traced to the wider use of forged dural parts for engines and airplanes.

The anniversary meeting of the Chapter on June 27 at Machinery Sales Co. headquarters will celebrate its first year of achievement as one of the fastest growing chapters. Refreshments will be served by the above-mentioned concern and a record breaking turnout of Tool Engineers is expected. On June 15. the first annual picnic was held at Griffith Park.

DAYTON

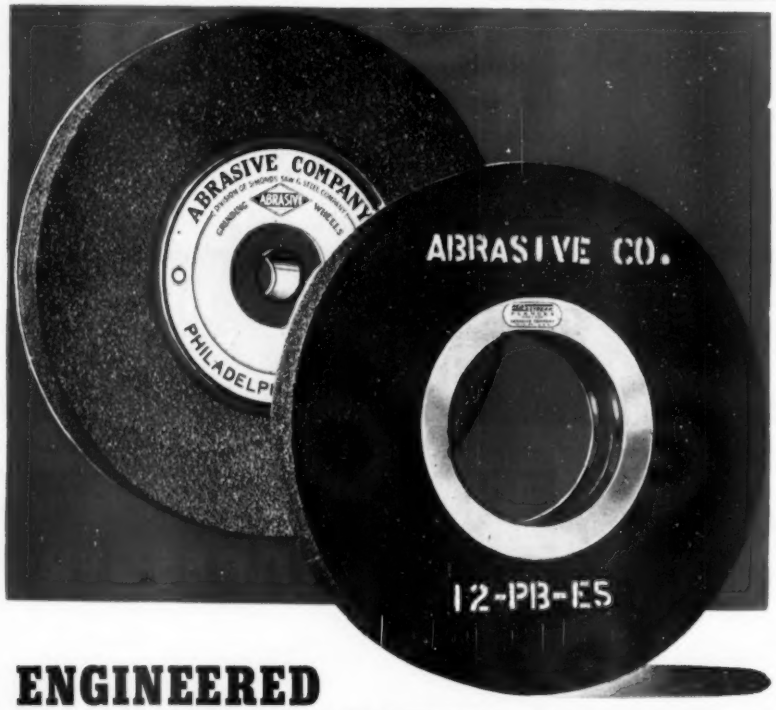
The Dayton Chapter held its meeting on June 10 after a dinner at the Hotel Gibbons. 62 were present at the Meeting.

DETROIT

Detroit's May and June Meetings may be called Chapter high-lights, as "No. 1" members and guests visited, respectively. Ford Motor Die Shop and Saginaw Steering Gear Division of General Motors. The latter, however, was brought to the audience via movie which, be it said, was more eloquent than words. The pictorial lecture aptly illustrated the "before and after" treatment of sick methods, with the rejuvenation leaving little to be desired. Clyde Hause, Detroit Chairman, turned the June meeting over to Al Sargent, past Nat'l Sec'y. who introduced the sponsors of the program; A. W. Phelps, Gen'l Works Manager, O. W. Habel, Works Manager, and G. G. Kearful, methods engineer, and Curt Beckmann (who is accredited with the splendid photography) of Saginaw Steering Gear. The subject —"Economy of Motion in Machine Design"—was timely, and the picture, in color, was remarkably clear and illustrative. While fairly long, it seemed all too brief because of its sustained interest and educational features.

The May Meeting, at Ford Motor Company, somehow missed the June Tool Engineer. The Ford Motor Company sent the visitors home with memory of a fine dinner and a vivid impression of America's most modern tool and die shop.

In the meanwhile, the golfers are polishing their clubs for the Annual Golf Tournament, to be teed off July 20 at BONNIE BROOK with a banner attendance expected. (Watch your stance, boys —there'll be movies!) Then, Aug. 16. the First Annual A.S.T.E. Moonlight Cruise! Four hours of cool breezes, song, dance and merriment; so, shake the mothballs out of your yachting togs and get aboard. Interest in the cruise runs high, with hopes that Toledo will be on deck. It's just a jaunt from Toledo anyway. Welcome, Tool Engineers, to the Cruise!



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FOR MAXIMUM GRINDING PRODUCTION

ABRASIVE COMPANY GRINDING WHEELS are manufactured in grain and grade specifications especially adapted to give best results on your production grinding machines. Maximum grinding efficiency involves speed of cutting action, length of wheel life and quality of finish or work obtained. Our extensive manufacturing facilities and engineering resources are directed wholly towards the most efficient combination of these factors which will give you the best production from your grinding operations.

Abrasive Company offers a complete grinding wheel and abrasive service for all operations from coarse snagging in foundries and steel mills to the finest precision grinding in metal-working production, tool rooms and machine shops. For better service from the grinding wheels you use investigate ABRASIVE Wheels—engineered for your work! Our representatives will be glad to make complete data available to you.

Prompt service from local stocks through industrial distributors in all principal cities.

ABRASIVE
GRINDING WHEELS
UNEXCELLED IN
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ABRASIVE COMPANY
Division of Simonds Saw and Steel Co.
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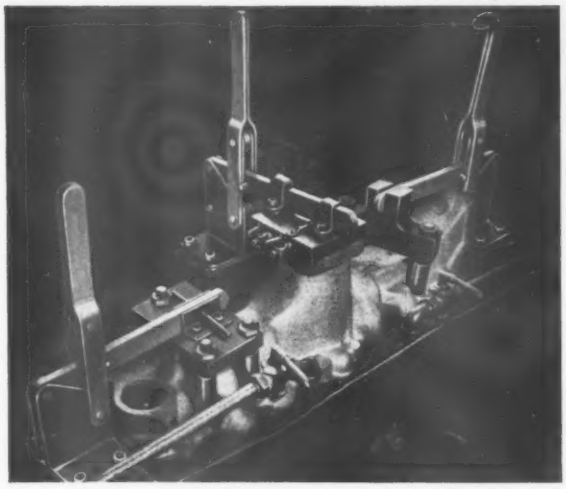


Do You Machine Castings?

If you machine castings or metal parts, then you have the problem of momentarily holding the parts in fixtures.

We make a complete line of quick-acting toggle clamps—nationally accepted as the modern, efficient, low-cost method of designing production and checking fixture.

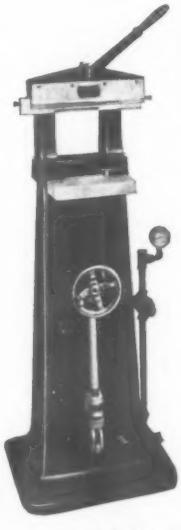
Send now for De-Sta-Co Toggle Clamps new Bulletin No. 40, so as to have it before you when designing that next job.

DETROIT STAMPING COMPANY
In Business for More than 25 Years
3455 West Fort Street **Detroit, Mich.**

SHERLOCK HOLMES

On Relief!

SLEUTHS NO LONGER NEEDED . . . WHEN COMPONENT PARTS Are



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PROPERLY MARKED PARTS ARE EASILY IDENTIFIED! ELIMINATE ERROR AND GUESSING.

HI-DUTY

Marking Machines

ARE BUILT TO MARK YOUR PARTS

Quickly

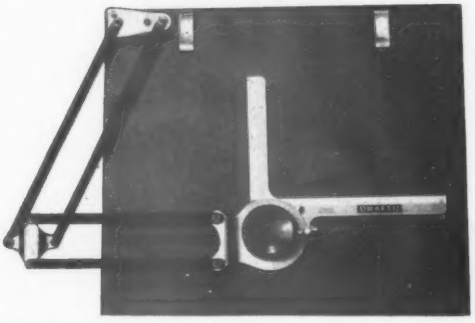
Send samples showing lettering and its location on the part with required daily production. We will make recommendations.

GEO. T. SCHMIDT, INC.
4102 Ravenswood Ave. **Chicago, Ill.**

—DRAFTO—

The Portable Drawing Machine For the Salesman, Shop Foreman, Engineer

SKETCH THAT IDEA

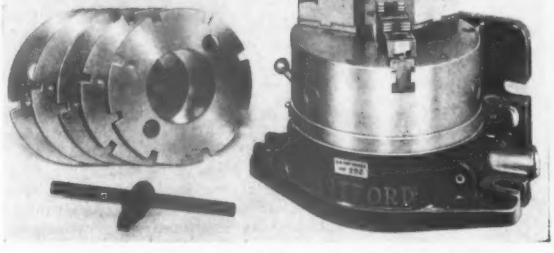


Every salesman or shop foreman needs one. Buy one today so you can convey your ideas of that tool or fixture. It is handy for the salesman. You can slip it in your bag and have it ready for use at any time. Write for descriptive literature on larger sizes and accessories.

Price — $4.50 as illustrated. Takes sheets 9" x 12".

THE DRAFTO COMPANY
COCHRANTON, PA.

STEP UP PRODUCTION With The Hartford "SUPER-SPACER"



ACCURATE—RIGID—FOOL-PROOF

The Hartford Super-Spacer is a new and superior spacing device for the rigid control of accurate machining operations within its scope. It is simple and rugged in design, substantially and precisely constructed and adaptable for a multitude of machining operations. Speeds and feeds limited only by the capacity and power of the machine are available with the Super-Spacer. Heavy cuts do not impair the accuracy of indexing, which is extremely rapid and positive—without the possibility of error. This chuck provides a secure and sufficient means for holding most jobs.

For Further Information Write

THE HARTFORD SPECIAL MACHINERY COMPANY

HARTFORD **CONNECTICUT**

INDUSTRY'S REQUIREMENTS

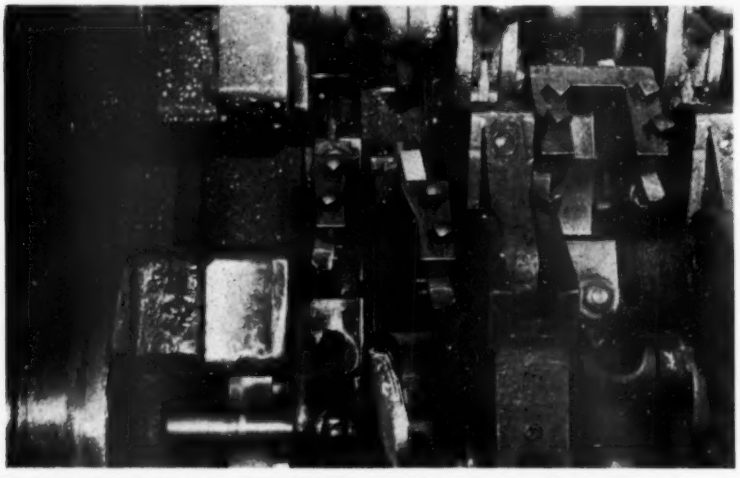
(Continued from page 12)

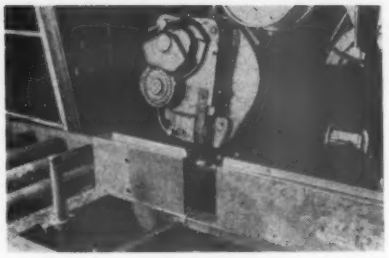
That is another picture of the same set-up. It might seem a minor setup to you fellows but the fact is that we supply not only our own assembly there in Detroit but assembly plants in Evansville, Indiana and in Los Angeles. We have to have trouble free fuel tanks going out to those assembly plants. So we have to pay a lot of attention to this kind of an operation. I only mention it here because it is one of those things that could easily be overlooked. But our tool division hasn't overlooked it and it has been a worthwhile saving.

Slide No. 18

When you figure the number of cars, the number of units, whatever it may be, that we produce, these things become important. And the saving is important, as illustrated by the examples I have given you. In conclusion, I want to say that what we need is uniformity in tool material. We also need a tool material of the quality of tungsten carbide without the brittleness, which, of course, is a well recognized requirement. If we had that

SLIDE 18





SLIDE 16

I think the Plymouth Plant would be universally tooled with such material. When we come into a tough operation like the crankshaft, a forged steel part, and these tools that are capable of standing the heat of a high speed cut can't stand the shock of an interrupted cut, that is the condition we need to correct.

A.S.T.E. Joins American Standards Association

According to an announcement made recently by Ford R. Lamb, Executive Secretary of A.S.T.E., the Society has joined the American Standards Association. The Society's membership in the A.S.A. will be represented by E. W. Ernest, as Chairman of the A.S.T.E. Standards Committee, and a factory Superintendent at General Electric Company, Schenectady, N. Y. C. J. Ives, Ives Engineering Company, Chicago and Carl J. Oxford, of National Twist Drill & Tool Company, Detroit will also represent A.S.T.E. as alternates on the A.S.T.E. Mechanical Standards Committee.

The TAP Establishes
ITS *OWN* LEAD !

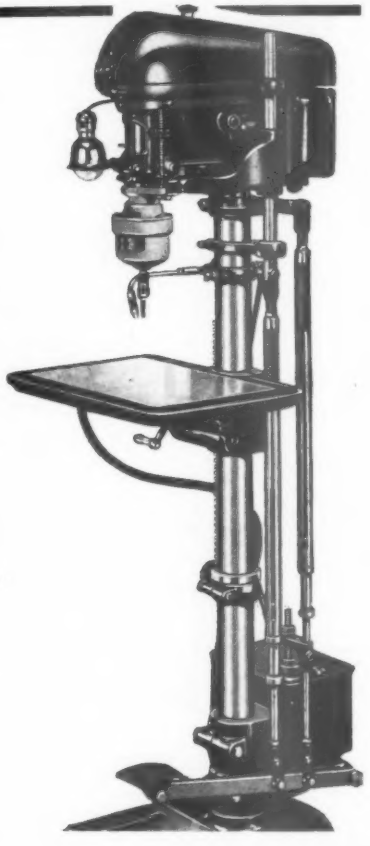
which means:

1. **More Accurate Tapping—with every thread uniform.**
2. **Greater Production — with less spoiled work.**
3. **Less Tap Breakage.**

The new Procunier Universal Tapping Machine is so designed that it actually allows the tap to establish its own lead. There is nothing more accurate than the tap itself in thread-cutting—so maximum tapping efficiency is attained where the tap is free to establish its own lead in cutting the thread.

HOW ONLY "PROCUNIER" ACCOMPLISHES THIS

Here is the exclusive combination of Procunier features that makes this possible: 1. Counter-balancing features that remove weight from tap. 2. Sensitive friction clutch that engages smoothly at high speeds; 3. Compensating springs between foot pedal and tap that provide uniform pressure on every hole *independent of the operator;* 4. Rigid spindle that holds tap accurate; 5. The smaller, lighter, more sensitive and accurate Tru-Grip holder. 6. Both hands free for handling work. PLUS many other advantages. Tapping operations are performed so quickly on this unit that most time is spent loading and unloading parts. In this connection, quick acting tapping fixtures are a vital factor—and here Procunier Engineers with over 30 years of tapping experience can help you solve your tapping problems. Send coupon below for Special Bulletin 38 and full details.



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Safety Chuck Co.
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CHICAGO

Procunier Safety Chuck Company
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Send me bulletins on: ☐ Universal Tapping Machines ☐ High Speed Tapping Heads ☐ Tru-Grip Tap Holder.
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Address.....
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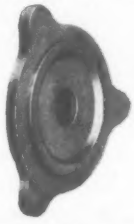
BOYAR-SCHULTZ PROFILE GRINDER

Grinding contours, profiles, uneven surfaces and odd difficult shapes is now a matter of minutes instead of hours of tedious hand work that was necessary before the BOYAR-SCHULTZ PROFILE GRINDER was developed.

Fitting dies and punches, grinding cams and templates formerly required hours of toolmakers' time. The same work is now done ***better*** and more ***quickly*** with BOYAR - SCHULTZ PROFILE GRINDER. It saves its cost in a short time.



For production grinding also. At left is illustrated an example of outside cam contour grinding in production. The work of BOYAR-SCHULTZ PROFILE GRINDER No. 1.

Write for Literature

BOYAR - SCHULTZ CORPORATION
2116 Walnut Street — Chicago, Illinois

DIE CUSHIONS

Equip your presses for deep drawing work for as low as $50.00 complete.

Write for Engineering Data on Deep Drawing Die Work

DAYTON-ROGERS MFG. CO.
2821 13th Ave. South — Minneapolis, Minn.

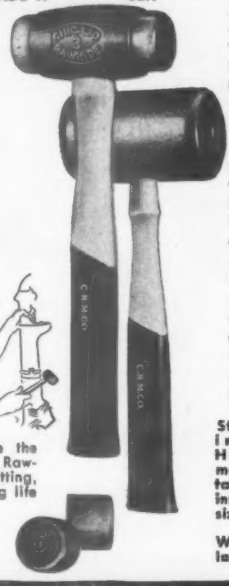
THESE ARE THE TOOLS

★ . . . that end losses from battering, cracking and marring—that strike effective blows without injuring finely finished surfaces . . . are the proper tools for setting-up machine tools, die setting, assembly work, motor maintenance and a hundred other jobs.

NO FATIGUING BOUNCES
NO CHIPPING OR SPLITTING
HEADS NEVER LOOSEN

FOR *setting up*

FOR *die maintenance*



Faced with hard coiled, Java Water Buffalo hide that has been mechanically treated and hydraulically compressed, Chicago Rawhide Hammers and Mallets are accurately balanced and have full-shaped handles. They hold their true face, strike accurately and outlast all other "soft" hammers.

These replaceable faces are the economy feature of Chicago Rawhide Hammers. Accurately fitting, hard coiled faces for the long life malleable heads.

FOR *assembly*

Stocked by leading Supply Houses. Hammers in 6 sizes take replaceable insert faces, 7 sizes of Mallets.

Write for Circular.

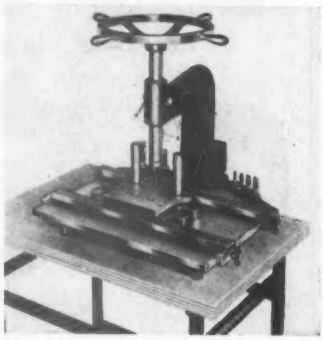
CHICAGO *Rawhide* MFG. CO.
1393 ELSTON AVE · CHICAGO · U·S·A·

! Save TIME STOP BREAKAGE

with a new

VIKING TAPPER

(Formerly Master Tapper)



It's no news that time is money, so why pay a skilled man to tap holes that can be more accurately done by machine? The new VIKING TAPPER requires but one-fifth of the time! By keeping tap in perfect alignment and effecting a smooth, even cutting tension, breakage is eliminated and the use of high speed ground thread taps is permitted. The saving on taps alone will soon pay for the cost of the machine.

The VIKING TAPPER comes equipped with 8 quick-changing adapters that bring tap changing time down to five seconds. Broached to fit the square of the tap, these adapters assure a positive drive. A long spindle does away with the need of a tap extension for reaching work with inconvenient projections. Work is held firmly in place by two sliding parallel bars. This tapper will handle all standard machine screw sizes from ¼ to ⅜. Write for booklet and prices.

THE VIKING TOOL & MACHINE CORP.
OFFICE & PLANT: 4 Main St., Belleville, N. J.

GAMMONS
OF
Manchester

PRODUCTION TOOLS

ORIGINATORS AND
MANUFACTURERS OF HELICAL
FLUTED TAPER PIN REAMERS

THE GAMMONS-HOLMAN CO., MANCHESTER, CONNECTICUT

ON TIME . .

SPEED UP DELIVERY OF STEEL PARTS

Machine with

KENNAMETAL

Style No. 11
Chip Breaker Tool

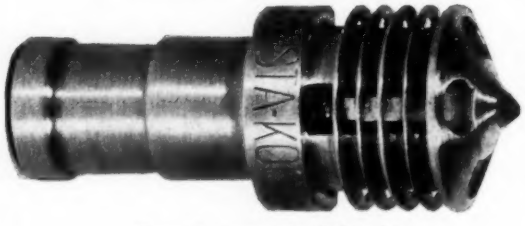
Promise faster deliveries . . . ***and make them*** . . . by specifying KENNAMETAL tools on all your steel cutting jobs. For KENNAMETAL machines steel of all hardnesses up to 550 Brinell at speeds from 2 to 6 times faster than high speed steel . . . often combines roughing and finishing in one operation . . . and requires far less down time for resharpening tools.

Prepare now for the business upturn . . . increase your production capacity, get ready for prompt deliveries, by tooling up with KENNAMETAL. For further details, write:

McKENNA METALS Co.
600 LLOYD AVENUE
LATROBE, PENNSYLVANIA, U.S.A.

JK SMIT SONS

Precision Diamond Tools



For Accurate Work

The illustration above shows the effective design of the STA-KOOL Diamond Tool Holder.

STA-KOOL—Dissipates Heat
Prolongs Life
Reduces Cost

Write for further information about STA-KOOL—"Tool Engineered" for precision.

J. K. SMIT & SONS, INC.
157 Chambers Street, New York, N. Y.
968 Farmington Ave., Hartford, Conn.
Law and Finance Bldg. Pittsburgh, Pa.
Detroit — Chicago — Seattle — Toronto

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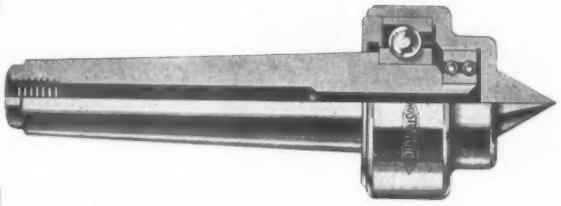

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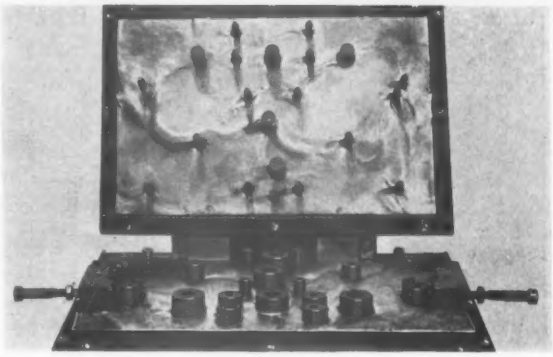

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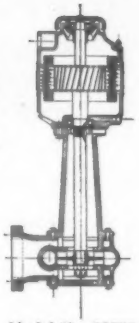

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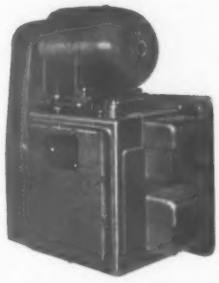

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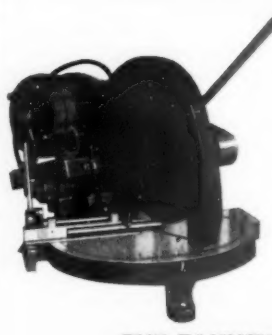

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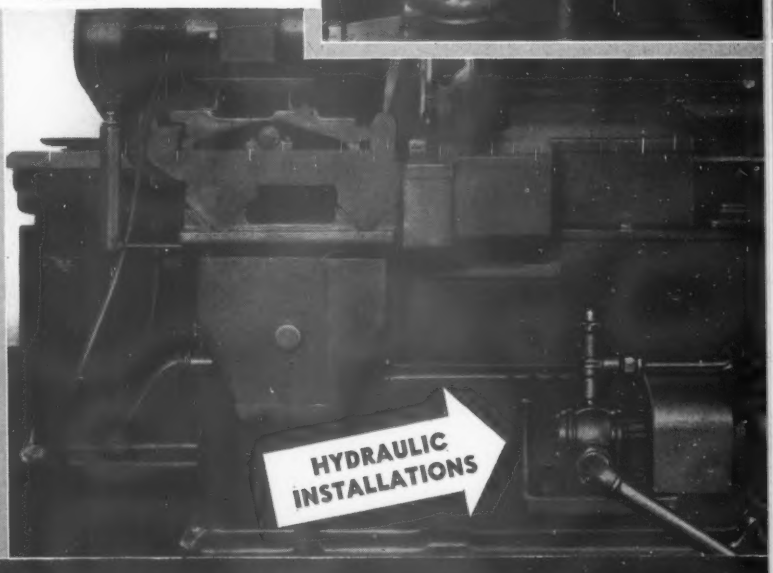

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